EXHIBIT 1

US006214155B1

(12) **United States Patent**
Leighton

(10) **Patent No.: US 6,214,155 B1**
(45) **Date of Patent: Apr. 10, 2001**

(54) **RADIO FREQUENCY IDENTIFICATION CARD AND HOT LAMINATION PROCESS FOR THE MANUFACTURE OF RADIO FREQUENCY IDENTIFICATION CARDS**

(76) Inventor: **Keith B. Leighton**, 2817 Palmer Rd., Lorain, OH (US) 44053

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/158,209**

(22) Filed: Sep. 22, 1998

Related U.S. Application Data

(63) Continuation of application No. 08/727,789, filed on Oct. 7, 1996, now Pat. No. 5,817,207.
(60) Provisional application No. 60/005,685, filed on Oct. 17, 1995.

(51) Int. Cl.[7] B32B 31/20
(52) U.S. Cl. 156/296; 156/311
(58) Field of Search 156/298, 312

(56) **References Cited**

U.S. PATENT DOCUMENTS

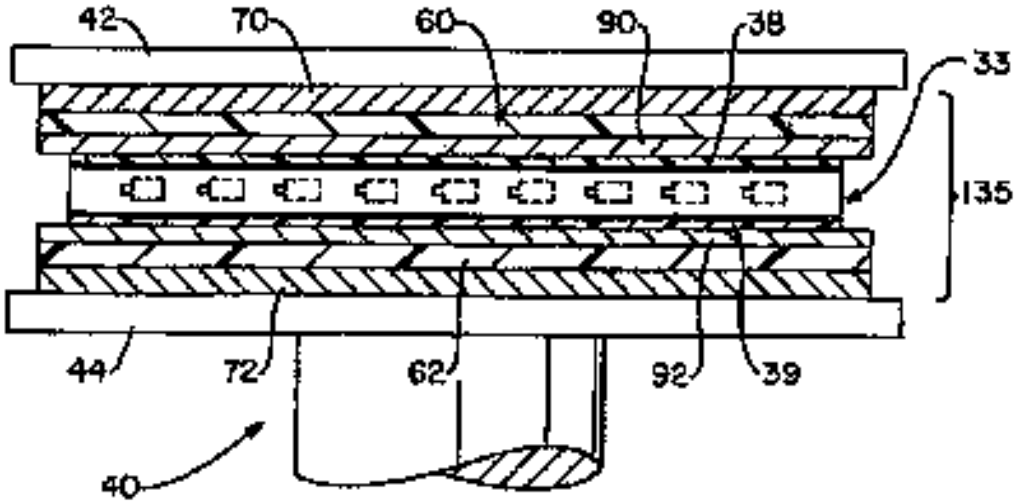
3,994,225	11/1976	Steinberger	101/401
4,450,024	5/1984	Hagiki-Tokura et al.	156/186
4,701,235	10/1987	Vieillefosse	156/252
4,792,803	12/1988	Hagiki-Tokura et al.	257/679
4,795,892	1/1989	Bernstein et al.	235/487
4,841,134	6/1989	Hibi et al.	235/488
4,960,802	10/1990	Champagne et al.	364/764
5,067,008	11/1991	Yasuda et al.	257/709
5,087,317	3/1992	Champagne et al.	235/488
5,173,849	12/1992	Kochi et al.	361/737
5,206,450	5/1993	Uenishi et al.	235/492
5,268,699	12/1993	Lentz et al.	343/702
5,272,598	12/1993	Hower et al.	361/833
5,286,430	3/1995	Tsuwaki	455/38.2
5,412,193	5/1995	Hess	235/380
5,438,750	8/1995	Yosenbre	29/829
5,567,362	10/1996	Gass	264/1.31
5,800,628	9/1998	Mundigl et al.	29/600.3

Primary Examiner—Francis J. Lorin
(74) *Attorney, Agent, or Firm*—Oldham & Oldham Co., L.P.A.

(57) **ABSTRACT**

A plastic card, such as a radio frequency identification card, including at least one electronic element embedded therein and a hot lamination process for the manufacture of radio frequency identification cards and other plastic cards including a micro-chip embedded therein. The process results in a card having an overall thickness in the range of 0.028 inches to 0.032 inches with a surface suitable for receiving dye sublimation printing—the variation in card thickness across the surface is less than 0.0005 inches. A card manufactured in accordance with the present invention also complies with all industry standards and specifications. Also, the hot lamination process of the present invention results in an aesthetically pleasing card. The invention also relates to a plastic card formed in accordance with the hot lamination process of the present invention.

16 Claims, 3 Drawing Sheets



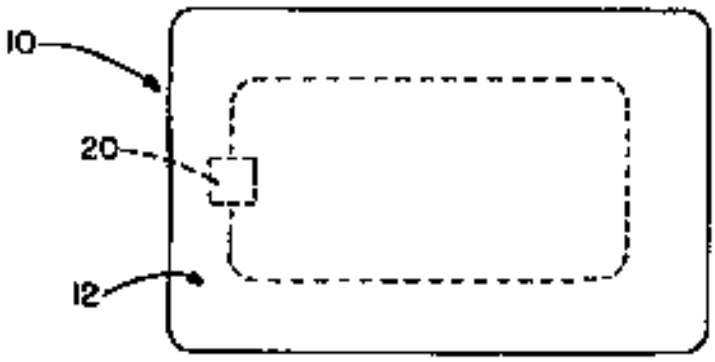


FIG.-1

FIG.-2

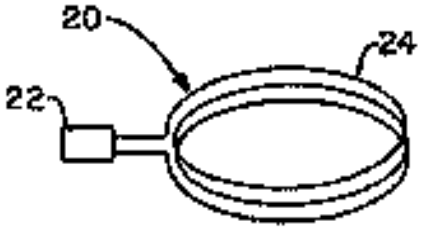


FIG.-3A

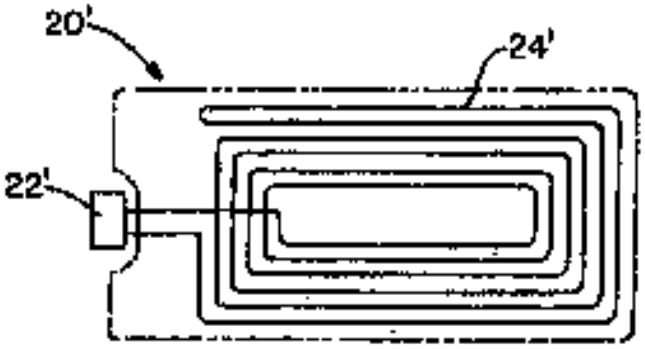


FIG.-3B

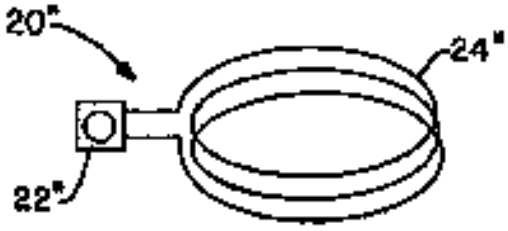


FIG.-3C

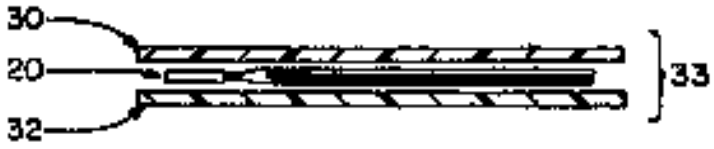


FIG.-4

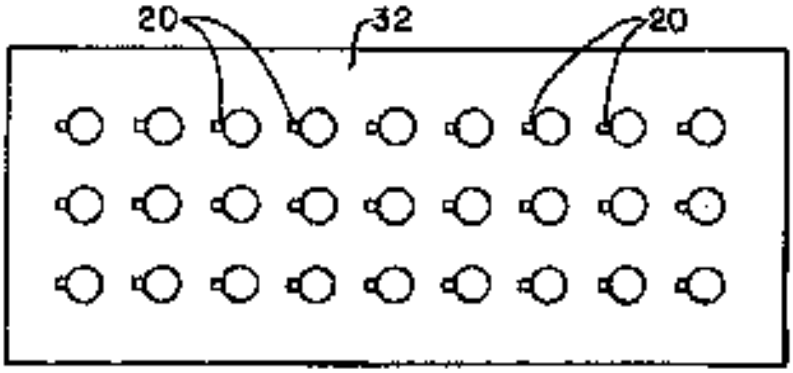


FIG.-5

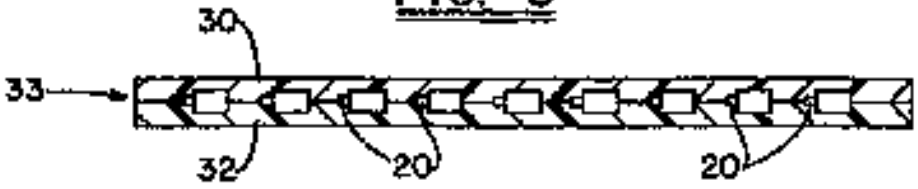


FIG.-6

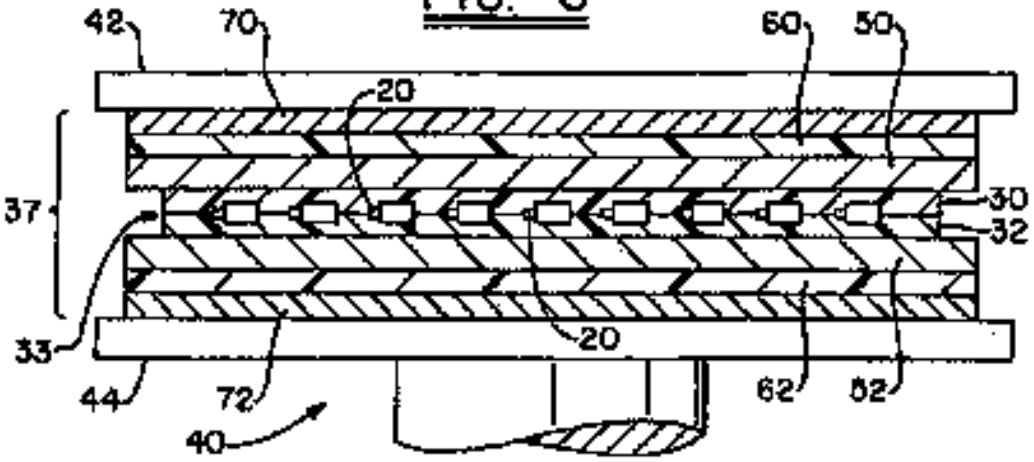


FIG.-7

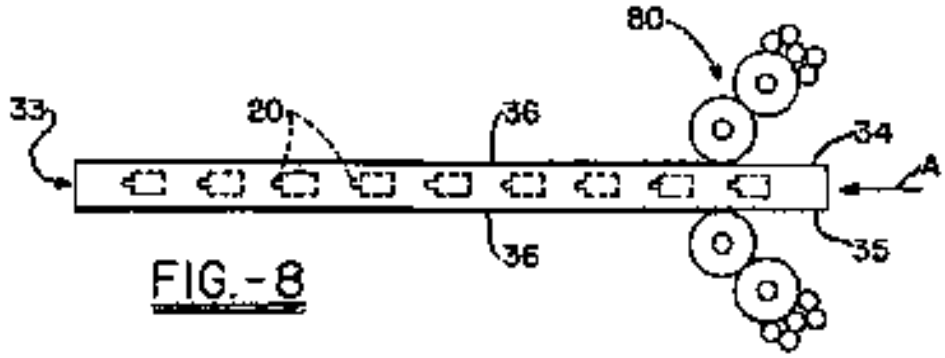


FIG.-8

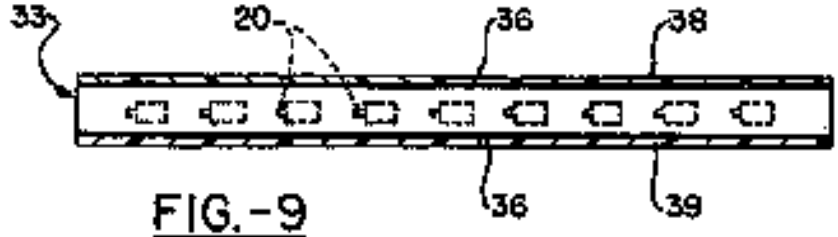


FIG.-9

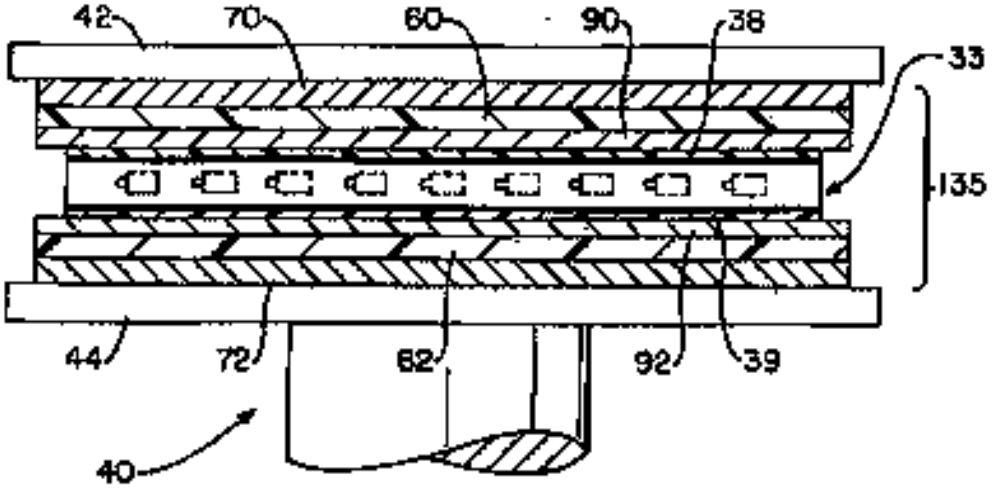


FIG.-10

RADIO FREQUENCY IDENTIFICATION CARD AND HOT LAMINATION PROCESS FOR THE MANUFACTURE OF RADIO FREQUENCY IDENTIFICATION CARDS

This application is a continuation of Ser. No. 08/727,789, now U.S. Pat. No. 5,817,207 which claims the benefit of provisional application 60/005,085 filed on Oct. 17, 1995.

FIELD OF THE INVENTION

The present invention relates generally to plastic cards and the manufacture thereof, and more particularly to radio frequency identification (RFID) cards and the manufacture of RFID cards that conform to industry size and performance standards and conventions and that have a superior outer surface to known RFID cards such that card may receive dye sublimation printing or the like.

BACKGROUND OF THE INVENTION

As the use of plastic cards for credit cards, automated teller machine (ATM) cards, identification cards, and the continues to become more widespread, the problems associated with the use of such cards correspondingly increase. Credit card fraud and identification card fraud are becoming larger problems everyday, and this fraud has introduced uncertainties into our systems of commerce and our security systems. Using easily available technology, criminals are able to manufacture credit/debit cards, ATM cards, identification cards, and the like having another's account code, identification code, or other personal information embedded in the magnetic stripe thereof. Thus, for example, criminals may steal hundreds or thousands of legitimate credit card account numbers and manufacture many additional cards bearing the stolen information. These fraudulent cards are then usable by the criminals to purchase goods and to receive cash with the legitimate card holder and the card issuer left holding the bill. Likewise, so called debit cards are becoming increasingly popular. These cards have stored thereon a certain amount of value for which the card owner has previously paid. For example, a subway rider may purchase a card good for 50 fares, with one fare being deducted from the card each time the owner rides the subway. Criminals have also been able to manipulate the data stored on these cards to defraud the merchants and others.

The ease in which criminals have been able to manufacture and or manipulate known cards results from the existence of the easily altered magnetic stripe storage medium used by known cards. These magnetic stripes are easily programmed and reprogrammed using commonly available technology. Thus, there has been found a need in the plastic card industry to provide a more secure plastic card that is very difficult or impossible to fraudulently manipulate. The most likely solution to the above-noted problems associated with known plastic cards is the RFID card and other cards including computer chips embedded therein rather than, or in addition to, a magnetic stripe. While these RFID cards and like have been found to be successful in preventing or limiting fraud, they are more difficult and expensive to manufacture relative to ordinary magnetic stripe cards. One of the biggest obstacles to the wide spread manufacture and use of RFID cards has been the inability of card manufacturers to manufacture an RFID card that meets all industry standards and specifications, such as those set by the International Standards Organization (ISO), that are sufficiently aesthetically pleasing (wherein the embedded electronics are

hidden from view), and that have a sufficiently regular or flat surface such that one or both surfaces of the card may be printed on using the very popular and widespread dye sublimation technology. Known plastic cards with computer chips and like embedded therein are too thick to work in connection with existing card reading machinery (ATM machines, telephones, and like) and have a surface that is too irregular to properly and consistently receive dye sublimation printing. Furthermore, prior attempts to manufacture a sufficiently thin plastic card including a computer chip embedded therein have resulted in a card with inferior aesthetic qualities such as the ability to see the embedded computer chip through the plastic.

SUMMARY OF THE INVENTION

The present invention is therefore directed to a plastic card having at least one electronic element embedded therein and to a hot lamination method for the manufacture of plastic cards including at least one electronic element therein. The card has an overall thickness in the range of 0.028 inches to 0.032 inches and comprises a plastic core having at least one electronic element embedded therein with at least one of the upper and lower surfaces of the core comprising a coating printed or otherwise applied thereon. An overlaminate film is preferably provided over the coated surface of the core and the resulting card has a variation in thickness across the surfaces thereof of no greater than approximately 0.0005 inches. The hot lamination method of the present invention comprises the steps of providing first and second plastic core sheets, positioning at least one electronic element between the first and second core sheets to thus form a core, and placing the core in a laminator and closing the laminator without applying laminator ram pressure to the core. A heat cycle is applied to the core sheets in the laminator thus liquefying or partially liquefying the sheets. The laminator ram pressure is then increased in combination with the heat. A cooling cycle is then applied to the core in the laminator, preferably with an associated increase in ram pressure, and the core is removed from the laminator. At least one surface of the core is then printed on using a printing press or similar printing apparatus, a sheet of overlaminate film is placed on at least one side of the core, and the core is then again placed in a laminator. A heat cycle is applied to the core with its overlaminate film, and a cooling cycle is thereafter applied, resulting in a sheet of plastic card stock from which one or more cards may be cut. The invention is also directed to a card manufactured in accordance with the above process which results in a plastic card having a thickness in the range of approximately 0.028 inches to 0.032 inches with a surface smoothness of at least approximately 0.0005 inches as is required by ISO and American National Standards Institute (ANSI) standards.

The present invention provides numerous advantages over known plastic cards and known plastic card manufacturing processes, including the formation of a plastic card with electronic elements such as a computer chip embedded therein with a pleasing aesthetic appearance, with a sufficiently smooth and regular surface such that the card may receive dye sublimation printing, and with sufficient durability and characteristics to comply with all industry specifications and standards.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a plastic card in accordance with the present invention;

FIG. 2 is a side elevational view of the card shown in FIG. 1;

FIGS. 3A-3C are top plan views of various electronic elements that may be embedded in a card in accordance with the present invention;

FIG. 4 is an exploded, schematic view of an electronic element position between two plastic core sheets to form a core;

FIG. 5 is a top plan view of a plurality of electronic elements positioned on a sheet of plastic core stock such that they may be covered by a similar sheet of core stock;

FIG. 6 is a schematic cross-sectional view of one or more electronic elements positioned between sheets of plastic core stock;

FIG. 7 schematically illustrates a book comprising the core, as it is positioned in a laminator apparatus;

FIG. 8 schematically illustrates the core as it is being printed on after removal from the laminator using a printing press or similar printing apparatus;

FIG. 9 is a cross-sectional view schematically illustrating the application of an overlaminate film to at least one side of the core;

FIG. 10 schematically illustrates the core with overlaminate film, as it is placed in a laminator for final processing to form a sheet of card stock.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a plastic card including at least one electronic element embedded therein. The present invention also relates to a hot lamination process for the manufacture of plastic cards, and more particularly to a hot lamination process for the manufacture of plastic cards that include an electronic element, such as a computer chip or other electronic element embedded therein. The electronic element may perform a wide variety of functions and take a wide variety of forms. Such cards, without regard to the particular electronic element embedded therein, will hereinafter be referred to as radio frequency identification (RFID) cards. The present invention also relates to a card formed in accordance with the invention.

Referring now to FIG. 1, there can be seen a plastic RFID card 10 manufactured in accordance with the present invention and including an electronic element 20 embedded therein. Card 10 includes an upper surface 12 and a lower surface 14. Electronic element 20 may take a wide variety of forms and perform a wide variety of functions. As shown in FIGS. 3A-3C respectively, electronic element 20, 20', 20" may be provided by a micro-chip 22 including a wire antenna 24 connected thereto, a micro-chip 22' and a circuit board antenna 24', a read/write micro-chip 22" and a wire coil antenna 24", or any other suitable electronic element. These electronic elements 20, 20', 20" and their insertion into plastic cards is not new, however, the present invention provides a new hot lamination process for manufacturing plastic cards 10 with these electronic elements 20, 20', 20" embedded therein such that the cards 10 are of a superior quality, such that the cards 10 meet all ISO and other industry specifications and standards, in such that at least one of the upper and lower surfaces 12, 14 of card 10 is sufficiently smooth and is otherwise is capable of receiving dye sublimation printing. Specifically, a card in accordance with the present invention has a thickness of approximately in the range of 0.028 inches to 0.032 inches with a surface smoothness of 0.0005 inches.

As shown in FIGS. 4-10 one or more cards 10 in accordance with the present invention may be manufactured by positioning an electronic element 20 between first and second sheets of card stock 30, 32 to form a core 33. Preferably as shown in FIGS. 5-10, a plurality of cards are manufactured simultaneously, in this, a plurality of electronic elements 20 are positioned between the first and second sheets of plastic core stock 30, 32 (only the second sheet 32 begin shown in FIG. 5 for clarity). When a plurality of electronic elements 20 are positioned between first and second sheets plastic core stock 30, 32, electronic elements 20 are properly positioned relative to one another such that a plurality cards may be cut from the resulting card stock. Plastic core sheets 30, 32 may be provided by a wide variety of plastics, the preferred being polyvinyl chloride (PVC) having a thickness in the range of 0.007 inches to 0.024 inches and preferably having a thickness of approximately 0.0125 inches each. Those skilled in the art will recognize that the thickness of the plastic core sheets will depend upon the thickness of the one or more electronic elements that are to be embedded therebetween. Other suitable plastics that may be utilized include polyester, acrylonitrile-butadiene-styrene (ABS), and any other suitable plastic.

Subsequent to placing one or more electronic elements 20 between the first and second sheets 30, 32 of plastic core stock to form a core 33, this core 33 is placed in a laminator apparatus 40 of the type well known in the art of plastic card manufacturing. As is shown in FIG. 7, laminator 40 includes upper and lower platens 42, 44 for applying ram pressure to an article positioned therebetween. In addition to the ability to apply ram pressure, laminator 40 is preferably of the type having controlled platens 42, 44 that may provide both heat and chill cycles and preferably includes cycle timer to regulate cycle time. Core 33 is positioned between first and second laminating plates 50, 52, one of which is preferably matte finished to provide laminated core 33 with at least one textured outer surface. First and second laminating pads 60, 62 are positioned outside of the laminating plates 50, 52, and first and second steel plates 70, 72 are likewise positioned outside of pads of 60, 62 and the entire assembly forms a book 35 for being positioned in laminator 40 between platens 42, 44.

Once book 35 is positioned in laminator 40 as shown in FIG. 7, the first lamination cycle is initiated by closing laminator platens 42, 44, preferably applying little or no ram pressure to book 35. A laminator heat cycle is initiated, bringing the temperature of platens 42,44 up to a range of 275° F. to 400° F., and most preferably up to a range of 300° F. to 370° F. for a period of greater than 5 minutes, and preferably in the range of 7 to 10 minutes. Once the heat cycle has been applied to the book 35 as is set forth above, the ram pressure of laminator 40 is increased to facilitate the flow of the plastic core sheets 30, 32 so that the one or more electronic elements 20 are encapsulated there by, and so that sheets 30, 32 form a uniform core 33 (seen most clearly in FIGS. 8-10) with upper and lower surfaces 34, 36. As mentioned, the use of matte finished laminator plates 50, 52 provides surfaces 34, 36 with a slightly roughened or textured quality which will facilitate the application of a coating thereto as is discussed below. The ram pressure applied during the heat cycle and the length of the heat cycle may vary, depending especially upon the size of sheets 30, 32. For example, the cycle time may be in the range of 10-15 minutes. In one example, a ram pressure of 940.135 pounds per square inch (p.s.i.) was applied for 10-15 minutes to form a uniform core 33, using sheets 30, 32 of a size in the range of 12 inches by 24 inches to 24 inches by 36 inches.

Subsequent to the above heat cycle, laminator 40 applies a chill cycle to book 35 during which time the ram pressure

of the laminator 40 is increased, preferably by approximately 25% until the platens 42, 44 have cooled to approximately 40° F. to 65° F. for approximately 10–15 minutes. Core 33 may then be removed from laminator 40 for additional processing.

Subsequent to the removal of core 33 from laminator 40, and as illustrated in FIG. 8, core 33 is coated on at least one of it's upper and lower surfaces 34, 35 with a layer of printing ink 36. This may be accomplished using a wide variety of printing techniques such as offset printing, letterpress printing, screen printing, roller coating, spray printing, litho-printing, and other suitable printing techniques. As shown in FIG. 8, core 33 is fed in the direction indicated with arrow A through a printing press, a lithographic printer, or a similar apparatus 50. This printing step is performed to coat at least one surface 34, 35 of core 33 with a layer of aesthetically pleasing ink 36. This layer of ink 36 essentially hides the one or more electronic elements 20 that are embedded within core 33, and prevents these one or more electronic elements 20 from showing through the relatively thin core 33. In this manner, the one or more electronic elements 20 encapsulated in core 33 are completely hidden from view without requiring the plastic used in the manufacture core 33 to be excessively thick.

Referring now to FIGS. 9–10, the final processing of core 33, which now comprises a layer of ink 36 or the like on at least one surface 34, 35 thereof, is schematically illustrated. A layer of overlaminate film such as clear overlaminate film 38, 39 is positioned on at least one ink coated surface 34, 35 of core 33, and preferably core 33 is positioned between two similar sheets of overlaminate film 38, 39 as shown. Overlaminate film is very thin, for example in the range of 0.001" thick. A book 135 is then constructed for insertion into laminator 40 as is schematically illustrated FIG. 10. Book 135 comprising core 33, including at least one layer of ink 36 and at least one layer of overlaminate film 38, 39 is positioned between laminating plates which are preferably highly polished plates such as mirror finished stainless steel plates 90, 92. Book 135 also comprises first and second laminating pads 68, 69 and first and second steel plates 70, 72 as is discussed above in relation to FIG. 7.

When book 135 is positioned between upper and lower platens 42, 44 of laminator 40 as shown in FIG. 10, the laminator is closed and a heat cycle in the range of 175° F. to 300° F., and most preferably in the range of 190° F. to 275° F., is applied to book 135 for a period of 10 to 25 minutes with a ram pressure that varies depending upon sheet size or the ram size of the laminator 40, but which is typically approximately 1000 p.s.i. with an 18 inch diameter ram. The laminator 40 is then caused to execute a chill cycle, preferably with a corresponding increase in ram pressure. For example, the chill temperature may be in the range of 40° F. to 65° F. and last for a period of 10 to 25 minutes. A ram pressure increase of approximately 25% over the pressure used for the heat cycle has been found to be most preferable.

Subsequent to the above described second lamination cycle as illustrated in FIG. 10, a sheet of plastic card stock is provided which comprises at least core 33 with at least one surface 34, 35 thereof covered by a layer of ink 36, and with at least one surface 34, 35 thereof covered by a layer of overlaminate film 38, 39. Preferably plastic card stock manufactured in accordance with the present invention comprises core 33 covered on both surfaces 34, 35 with a layer of ink 36 which is positioned between layers of overlaminate film 38, 39, all of which has been laminated together as described. One or more cards 10 then may be cut from the resulting plastic card stock and card 10 will have a thickness in the range of 0.028 inches to 0.032 inches with variation in overall thickness across the surfaces 12, 14 thereof being no greater than approximately 0.0005 inches. The one or more cards 10 can thus be said to have a surface smoothness of approximately 0.0005 inches or better. Thus, a card 10 manufactured in accordance with the present invention includes at least one surface 12, 14 or preferably both surfaces 12, 14 that are sufficiently smooth and regular to receive dye sublimation printing.

Those skilled in the art will recognize that the foregoing description has set forth the preferred embodiment of the invention in particular detail and it must be understood that numerous modifications, substitutions, and changes may be undertaken without departing from the true spirit and scope of the present invention as defined by the ensuing claims.

What is claimed is:

1. A process for incorporating at least one electronic element in the manufacture of a plastic card, comprising the steps of:

(a) providing first and second plastic core sheets;

(b) positioning said at least one electronic element in the absence of a non-electronic carrier directly between said first and second plastic core sheets to form a core, said plastic core sheets defining a pair of inner and outer surfaces of said core;

(c) positioning said core in a laminator apparatus, and subjecting said core to a heat and pressure cycle, said heat and pressure cycle comprising the steps of:

(i) heating said core for a first period of time;

(ii) applying a first pressure to said core for a second period of time such that said at least one electronic element is encapsulated by said core;

(iii) cooling said core while applying a second pressure to said core,

(d) applying a layer of overlaminate film to at least one of said outer surfaces of said core.

2. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said laminator apparatus has first and second laminating plates, at least one of said first and second laminating plates having a matte finish for creating a textured surface on at least one of said outer surfaces of said core.

3. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 2, wherein each of said first and second laminating plates has a matte finish for creating said textured surface on both of said outer surfaces of said core.

4. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said first and second plastic core sheets are made from a material selected from the group consisting of polyvinyl chloride, polyester, and acrylonitrile-butadiene-styrene, each of said sheets having a thickness in the range of 0.007 to 0.014 inch.

5. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 4, wherein said first and second plastic core sheets have a thickness of approximately 0.0125 inch.

6. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said second pressure is greater than said first pressure.

7. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in

claim 6, wherein said second pressure is at least approximately 25% greater than said first pressure.

8. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said core is heated by step (c)(i) to a temperature in the range of 275° F. to 400° F. and said first period of time is at least five (5) minutes.

9. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said first pressure is approximately 1000 p.s.i. and said second period of time is at least 10 minutes.

10. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 9, wherein said step (d) of applying a layer of overlaminate film comprises the further steps of:

(a) positioning an overlaminate film on at least one surface of said core;

(b) subjecting said core to a second heat and pressure cycle comprising the steps of:

(i) heating said core to a temperature between approximately 275° F. to 300° F. for approximately 18 to 25 minutes;

(ii) applying approximately 1000 p.s.i. pressure to said core, and

(iii) cooling said core to a temperature in the range of approximately 40° F. to 65° F. for approximately 18 to 25 minutes.

11. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said at least one electronic element is a micro-chip and an associated wire antenna.

12. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said at least one electronic element is a micro-chip and an associated circuit board antenna.

13. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said at least one electronic element is a read/write integrated chip and an associated antenna.

14. A plastic card constructed in accordance with claim 1.

15. A hot lamination process for the manufacture of plastic cards, said process comprising the steps of:

(a) providing first and second plastic core sheets;

(b) positioning at least one electronic element in the absence of a non-electronic carrier directly between said first and second plastic core sheets to form a layered core;

(c) positioning said core in a laminator apparatus, and subjecting said core to a heat and pressure cycle, said heat and pressure cycle comprising the steps of:

(i) heating said core in said laminator, in the presence of a minimal first ram pressure, to a temperature which causes controlled flow of said plastic which makes up said first and second plastic core sheets;

(ii) applying a second pressure uniformly across said core for encapsulating said at least one electronic element within said controlled flow plastic;

(iii) subsequently cooling said core in conjunction with the concurrent application of a third pressure uniformly across said core, said core including said upper and lower surfaces.

16. The method as recited in claim 15 wherein said first and second core layers are devoid of any appreciable contents.

* * * * *

EXHIBIT 2

US005817207A

United States Patent [19]

Leighton

[11] Patent Number: 5,817,207

[45] Date of Patent: Oct. 6, 1998

[54] **RADIO FREQUENCY IDENTIFICATION CARD AND HOT LAMINATION PROCESS FOR THE MANUFACTURE OF RADIO FREQUENCY IDENTIFICATION CARDS**

[76] Inventor: **Keith R. Leighton**, 2017 Palmer Rd., Lorain, Ohio 44053

[21] Appl. No.: 727,389

[22] Filed: Oct. 7, 1996

Related U.S. Application Data

[60] Provisional application No. 60/005,485 Oct. 17, 1995.

[51] Int. Cl.[6] B32B 31/28

[52] U.S. Cl. 156/290; 156/312

[58] Field of Search 156/380, 312, 156/311, 295

[56] **References Cited**

U.S. PATENT DOCUMENTS

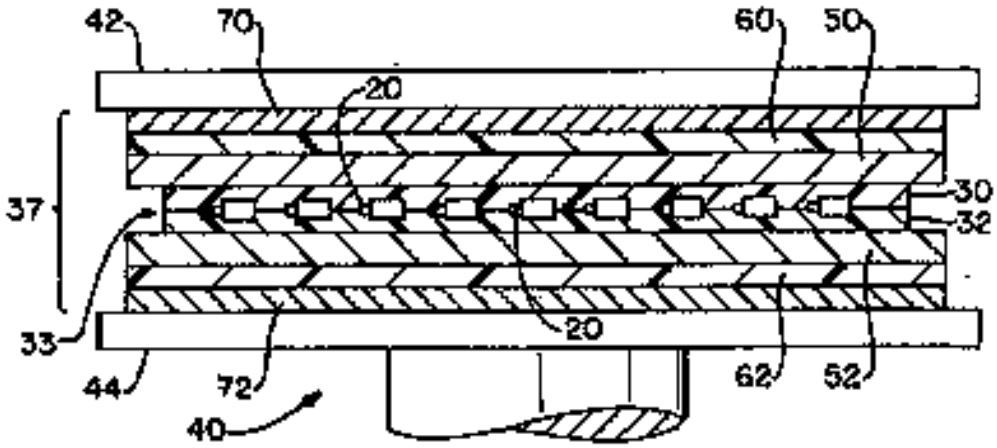
4,650,524	5/1984	Haghiri-Tehrani et al.	156/108
4,701,256	10/1987	Vieillefond .	
4,792,943	12/1988	Haghiri-Tehrani et al. .	
4,795,898	1/1989	Bernstein et al. .	
4,981,802	12/1990	Champagne et al. .	
5,067,008	11/1991	Yamada et al.	357/81
5,097,317	3/1992	Champagne et al. .	
5,175,640	12/1992	Kishi et al. .	
5,208,450	5/1993	Uenishi et al. .	
5,266,099	12/1993	Lasto et al. .	
5,306,650	3/1995	Terasaki	455/95.2
5,412,192	5/1995	Hoss .	
5,438,750	8/1995	Yamashita .	
5,567,362	10/1996	Cross .	

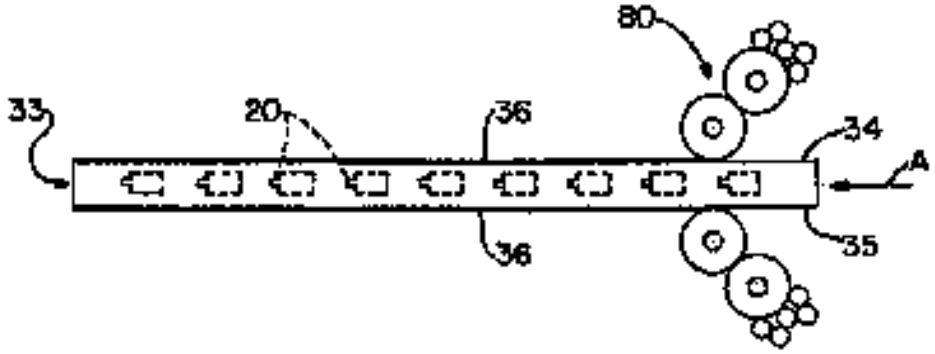
Primary Examiner—Francis J. Lorin
Attorney, Agent, or Firm—Oldham & Oldham Co., L.P.A.

[57] **ABSTRACT**

A plastic card, such as a radio frequency identification card, including at least one electronic element embedded therein and a hot lamination process for the manufacture of radio frequency identification cards and other plastic cards including a micro-chip embedded therein. The process results in a card having an overall thickness in the range of 0.028 inches to 0.032 inches with a surface suitable for receiving dye sublimation printing—the variation in card thickness across the surface is less than 0.0005 inches. A card manufactured in accordance with the present invention also complies with all industry standards and specifications. Also, the hot lamination process of the present invention results in an aesthetically pleasing card. The invention also relates to a plastic card formed in accordance with the hot lamination process of the present invention.

17 Claims, 3 Drawing Sheets





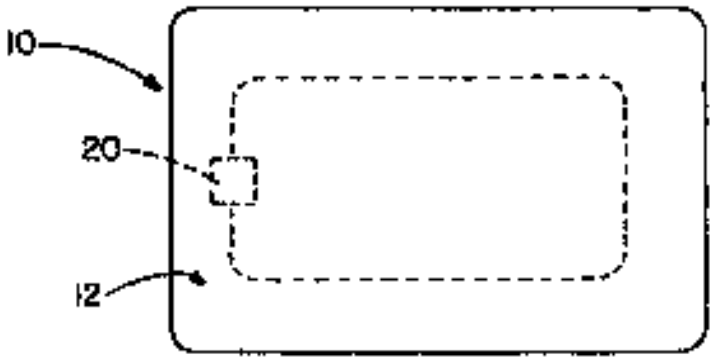


FIG.-1

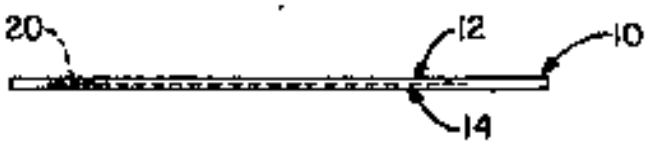


FIG.-2

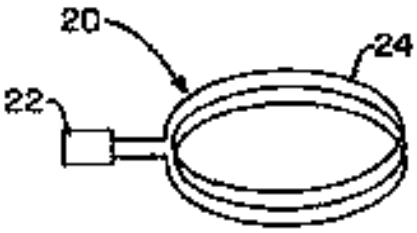


FIG.-3A

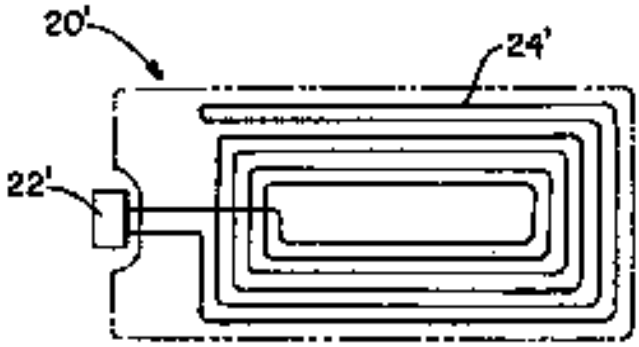


FIG.-3B

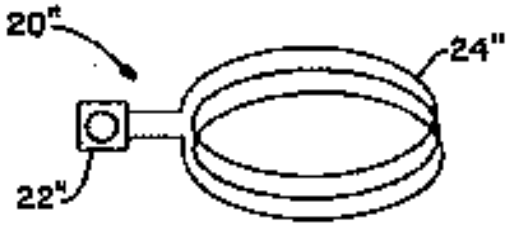


FIG.-3C

FIG.-4

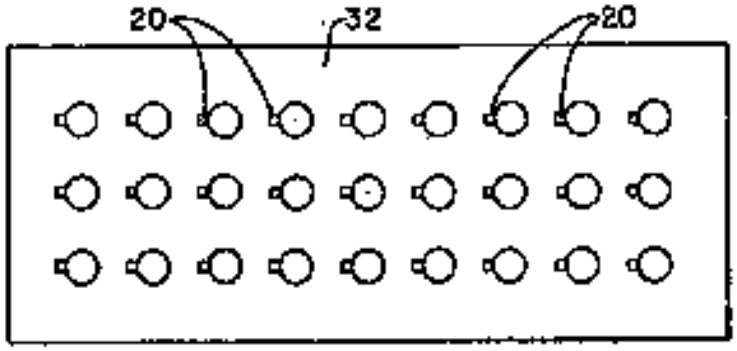


FIG.-5

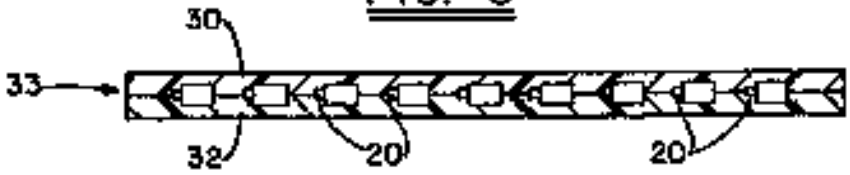


FIG.-6

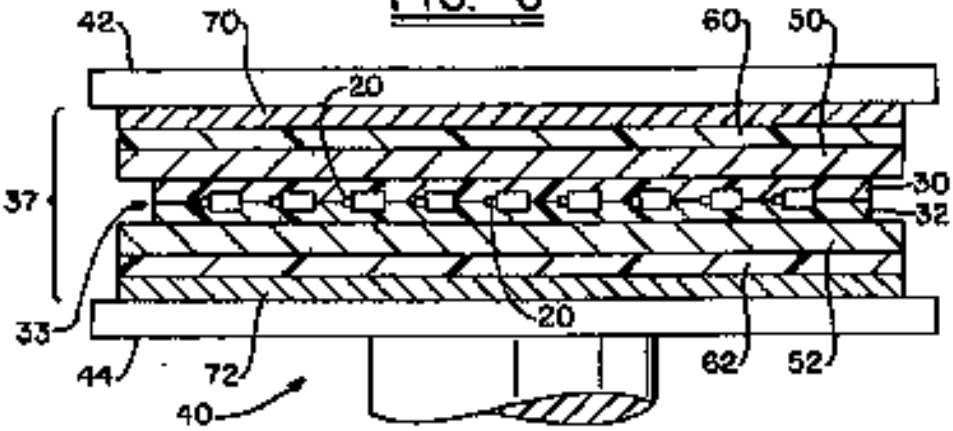


FIG.-7

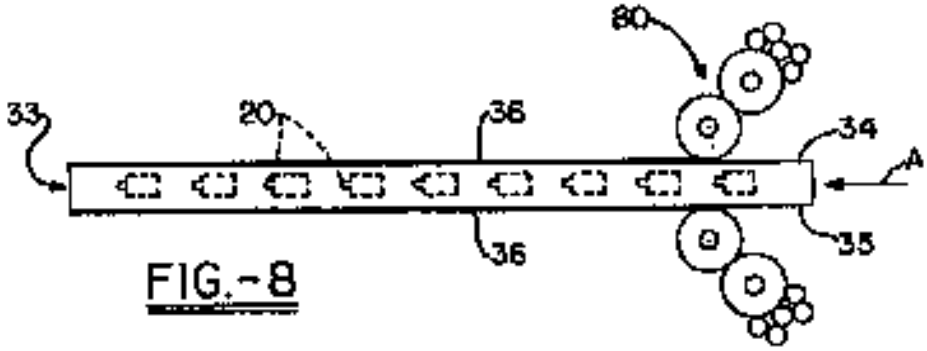


FIG.-8

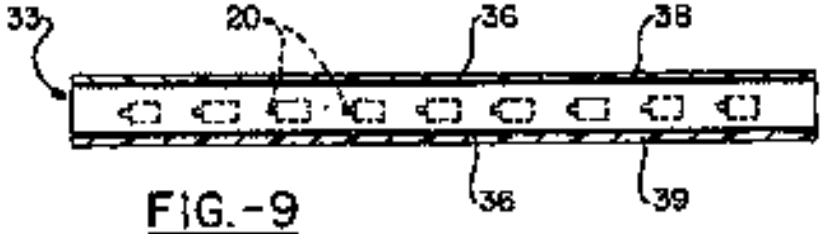


FIG.-9

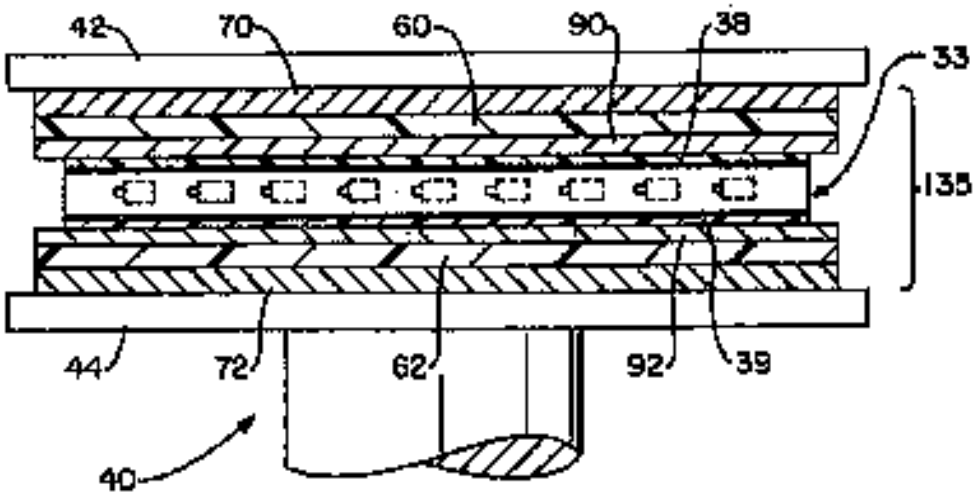


FIG.-10

RADIO FREQUENCY IDENTIFICATION CARD AND HOT LAMINATION PROCESS FOR THE MANUFACTURE OF RADIO FREQUENCY IDENTIFICATION CARDS

This application claims the benefit of the following U.S. Provisional Application No.: 60005,685, filing date Oct. 17, 1995.

FIELD OF THE INVENTION

The present invention relates generally to plastic cards and the manufacture thereof, and more particularly to radio frequency identification (RFID) cards and the manufacture of RFID cards that conform to industry size and performance standards and conventions and that have a superior outer surface to known RFID cards such that card may receive dye sublimation printing or the like.

BACKGROUND OF THE INVENTION

As the use of plastic cards for credit cards, automated teller machine (ATM) cards, identification cards, and like continues to become more widespread, the problems associated with the use of such cards correspondingly increase. Credit card fraud and identification card fraud are becoming larger problems everyday, and this fraud has introduced uncertainties into our systems of commerce and our security systems. Using easily available technology, criminals are able to manufacture credit/debit cards, ATM cards, identification cards, and the like having another's account code, identification code, or other personal information embedded in the magnetic stripe thereof. Thus, for example, criminals may steal hundreds or thousands of legitimate credit card account numbers and manufacture many additional cards bearing the stolen information. These fraudulent cards are then usable by the criminals to purchase goods and to receive cash with the legitimate card holder and the card issuer left holding the bill. Likewise, so called debit cards are becoming increasingly popular. These cards have stored thereon a certain amount of value for which the card owner has previously paid. For example, a subway rider may purchase a card good for 50 fares, with one fare being deducted from the card each time the owner rides the subway. Criminals have also been able to manipulate the data stored on these cards to defraud the merchants and others.

The ease in which criminals have been able to manufacture and or manipulate known cards results from the existence of the easily altered magnetic stripe storage medium used by known cards. These magnetic stripes are easily programmed and reprogrammed using commonly available technology. Thus, there has been found a need in the plastic card industry to provide a more secure plastic card that is very difficult or impossible to fraudulently manipulate. The most likely solution to the above-noted problems associated with known plastic cards is the RFID card and other cards including computer chips embedded therein rather than, or in addition to, a magnetic stripe. While these RFID cards and like have been found to be successful in preventing or limiting fraud, they are more difficult and expensive to manufacture relative to ordinary magnetic stripe cards. One of the biggest obstacles to the wide spread manufacture and use of RFID cards has been the inability of card manufacturers to manufacture an RFID card that meets all industry standards and specifications, such as those set by the International Standards Organization (ISO), that are sufficiently aesthetically pleasing (wherein the embedded electronics are

hidden from view), and that have a sufficiently regular or flat surface such that one or both surfaces of the card may be printed on using the very popular and widespread dye sublimation technology. Known plastic cards with computer chips and like embedded therein are too thick to work in connection with existing card reading machinery (ATM machines, telephones, and like) and have a surface that is too irregular to properly and consistently receive dye sublimation printing. Furthermore, prior attempts to manufacture a sufficiently thin plastic card including a computer chip embedded therein have resulted in a card with inferior aesthetic qualities such as the ability to see the embedded computer chip through the plastic.

SUMMARY OF THE INVENTION

The present invention is therefore directed to a plastic card having at least one electronic element embedded therein and to a hot lamination method for the manufacture of plastic cards including at least one electronic element therein. The card has an overall thickness in the range of 0.028 inches to 0.032 inches and comprises a plastic core having at least one electronic element embedded therein with at least one of the upper and lower surfaces of the core comprising a coating printed or otherwise applied thereon. An overlaminate film is preferably provided over the coated surface of the core and the resulting card has a variation in thickness across the surface thereof of no greater than approximately 0.0005 inches. The hot lamination method of the present invention comprises the steps of providing first and second plastic core sheets, positioning at least one electronic element between the first and second core sheets to thus form a core, and placing the core in a laminator and closing the laminator without applying laminator ram pressure to the core. A heat cycle is applied to the core sheets in the laminator thus liquefying or partially liquefying the sheets. The laminator ram pressure is then increased in combination with the heat. A cooling cycle is then applied to the core in the laminator, preferably with an associated increase in ram pressure, and the core is removed from the laminator. At least one surface of the core is then printed on using a printing press or similar printing apparatus, a sheet of overlaminate film is placed on at least one side of the core, and the core is then again placed in a laminator. A heat cycle is applied to the core with its overlaminate film, and a cooling cycle is thereafter applied, resulting in a sheet of plastic card stock from which one or more cards may be cut. The invention is also directed to a card manufactured in accordance with the above process which results in a plastic card having a thickness in the range of approximately 0.028 inches to 0.032 inches with a surface smoothness of at least approximately 0.0007 inches as is required by ISO and American National Standards Institute (ANSI) standards.

The present invention provides numerous advantages over known plastic cards and known plastic card manufacturing processes, including the formation of a plastic card with electronic elements such as a computer chip embedded therein with a pleasing aesthetic appearance, with a sufficiently smooth and regular surface such that the card may receive dye sublimation printing, and with sufficient durability and characteristics to comply with all industry specifications and standards.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a plastic card in accordance with the present invention;

FIG. 2 is a side elevational view of the card shown in FIG. 1;

FIGS. 3A-3C are top plan views of various electronic elements that may be embedded in a card in accordance with the present invention;

FIG. 4 is an exploded, schematic view of an electronic element position between two plastic core sheets to form a core;

FIG. 5 is a top plan view of a plurality of electronic elements positioned on a sheet of plastic core stock such that they may be covered by a similar sheet of core stock;

FIG. 6 is a schematic cross-sectional view of one or more electronic elements positioned between sheets of plastic core stock;

FIG. 7 schematically illustrates a book comprising the core, as it is positioned in a laminator apparatus;

FIG. 8 schematically illustrates the core as it is being printed on after removal from the laminator using a printing press or similar printing apparatus;

FIG. 9 is a cross-sectional view schematically illustrating the application of an overlaminate film to at least one side of the core;

FIG. 10 schematically illustrates the core with overlaminate film, as it is placed in a laminator for final processing to form a sheet of card stock.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a plastic card including at least one electronic element embedded therein. The present invention also relates to a hot lamination process for the manufacture of plastic cards, and more particularly to a hot lamination process for the manufacture of plastic cards that include an electronic element, such as a computer chip or other electronic element embedded therein. The electronic element may perform a wide variety of functions and take a wide variety of forms. Such cards, without regard to the particular electronic element embedded therein, will hereinafter be referred to as radio frequency identification (RFID) cards. The present invention also relates to a card formed in accordance with the invention.

Referring now to FIG. 1, there can be seen a plastic RFID card 10 manufactured in accordance with the present invention and including an electronic element 20 embedded therein. Card 10 includes an upper surface 12 and a lower surface 14. Electronic element 20 may take a wide variety of forms and perform a wide variety of functions. As shown in FIG. 3A-3C respectively, electronic element 20, 20', 20" may be provided by a micro-chip 22 including a wire antenna 24 connected thereto, a micro-chip 22' and a circuit board antenna 24', and a card/wafer micro-chip 22" and a wire coil antenna 24", or any other suitable electronic element. These electronic elements 20, 20', 20" and their insertion into plastic cards is not new, however, the present invention provides a new hot lamination process for manufacturing plastic cards 10 with these electronic elements 20, 20', 20" embedded therein such that the cards 10 are of a superior quality, such that the cards 10 meet all ISO and other industry specifications and standards, in such that at least one of the upper and lower surfaces 12, 14 of card 10 is sufficiently smooth and is otherwise is capable of receiving dye sublimation printing. Specifically, a card in accordance with the present invention has a thickness of approximately in the range of 0.028 inches to 0.032 inches with a surface smoothness of 0.0005 inches.

As shown in FIGS. 4-10 one or more cards 10 in accordance with the present invention may be manufactured by positioning an electronic element 20 between first and second sheets of card stock 30, 32 to form a core 33. Preferably as shown in FIG. 5-10, a plurality of cards are manufactured simultaneously, in that, a plurality of electronic elements 20 are positioned between the first and second sheets of plastic core stock 30, 32 (only the second sheet 32 being shown in FIG. 5 for clarity). When a plurality of electronic elements 20 are positioned between first and second sheets plastic core stock 30, 32, electronic elements 20 are properly positioned relative to one another such that a plurality cards may be cut from the resulting card stock. Plastic core sheets 30, 32 may be provided by a wide variety of plastics, the preferred being polyvinyl chloride (PVC) having a thickness in the range of 0.027 inches to 0.034 inches and preferably having a thickness of approximately 0.0125 inches each. Those skilled in the art will recognize that the thickness of the plastic core sheets will depend upon the thickness of the one or more electronic elements that are to be embedded therebetween. Other suitable plastics that may be utilized include polyester, acrylonitrile-butadiene-styrene (ABS), and any other suitable plastic.

Subsequent to placing one or more electronic elements 20 between the first and second sheets 30, 32 of plastic core stock to form a core 33, this core 33 is placed in a laminator apparatus 40 of the type well known in the art of plastic card manufacturing. As is shown in FIG. 7, laminator 40 includes upper and lower platens 42,44 for applying ram pressure to an article positioned therebetween. In addition to the ability to apply ram pressure, laminator 40 is preferably of the type having controlled platens 42,44 that may provide both heat and chill cycles and preferably includes cycle timer to regulate cycle time. Core 33 is positioned between first and second laminating plates 50, 52, one of which is preferably matte finished to provide laminated core 33 with at least one textured outer surface. First and second laminating pads 60, 62 are positioned outside of the laminating plates 50, 52, and first and second steel plates 70, 72 are likewise positioned outside of pads of 60, 62 and the entire assembly forms a book 35 for being positioned in laminator 40 between platens 42, 44.

Once book 35 is positioned in laminator 40 as shown in FIG. 7, the first lamination cycle is initiated by closing laminator platens 42, 44, preferably applying little or no ram pressure to book 35. A laminator heat cycle is initiated, bringing the temperature of platens 42,44 up to a range of 275° F. to 400° F., and most preferably up to a range of 300° F. to 370° F. for a period of greater than 5 minutes, and preferably in the range of 7 to 10 minutes. Once the heat cycle has been applied to the book 35 as is set forth above, the ram pressure of laminator 40 is increased to facilitate the flow of the plastic core sheets 30, 32 so that the one or more electronic elements 20 are encapsulated there by, and so that sheets 30, 32 form a uniform core 33 (seen most clearly in FIGS. 8-10) with upper and lower surfaces 34,36. As mentioned, the use of matte finished laminator plates 50,52 provides surfaces 34,36 with a slightly roughened or textured quality which will facilitate the application of a coating thereto as is discussed below. The ram pressure applied during the heat cycle and the length of the heat cycle may vary, depending especially upon the size of sheets 30, 32. For example, the cycle time may be in the range of 10-15 minutes. In one example, a ram pressure of 940.135 pounds per square inch (p.s.i.) was applied for 10-15 minutes to form a uniform core 33, using sheets 30,32 of a size in the range of 12 inches by 24 inches to 24 inches by 36 inches.

Subsequent to the above heat cycle, laminator 40 applies a chill cycle to book 35 during which time the ram pressure

of the laminator 40 is increased, preferably by approximately 25% until the platens 42,44 have cooled to approximately 40° F. to 65° F. for approximately 10–15 minutes. Core 33 may then be removed from laminator 40 for additional processing.

Subsequent to the removal of core 33 from laminator 40, and as illustrated in FIG. 8, core 33 is coated on at least one of it's upper and lower surfaces 34, 35 with a layer of printing ink 36. This may be accomplished using a wide variety of printing techniques such as offset printing, letterpress printing, screen printing, roller coating, spray printing, litho-printing, and other suitable printing techniques. As shown in FIG. 8, core 33 is fed in the direction indicated with arrow A through a printing press, a lithographic printer, or a similar apparatus 60. This printing step is performed to coat at least one surface 34, 35 of core 33 with a layer of aesthetically pleasing ink 36. This layer of ink 36 cosmetically hides the one or more electronic elements 20 that are embedded within core 33, and prevents these one or more electronic elements 20 from showing through the relatively thin core 33. In this manner, the one or more electronic elements 20 encapsulated in core 33 are completely hidden from view without requiring the plastic used in the manufacture core 33 to be excessively thick.

Referring now to FIGS. 9–10, the final processing of core 33, which now comprises a layer of ink 36 or the like on at least one surface 34,35 thereof, is schematically illustrated. A layer of overlaminate film such as clear overlaminate film 38,39 is positioned on at least one ink coated surface 34,35 of core 33, and preferably core 33 is positioned between two similar sheets of overlaminate film 38,39 as shown. Overlaminate film is very thin, for example in the range of 0.0015" thick. A book 135 is then constructed for insertion into laminator 40 as is schematically illustrated FIG. 10. Book 135 comprising core 33, including at least one layer of ink 36 and at least one layer of overlaminate film 38, 39 is positioned between laminating plates which are preferably highly polished plates such as mirror finished stainless steel plates 90, 92. Book 135 also comprises first and second laminating pads 68, 63 and first and second steel plates 70, 72 as is discussed above in relation to FIG. 7.

When book 135 is positioned between upper and lower platens 42,44 of laminator 40 as shown in FIG. 10, the laminator is closed and a heat cycle in the range of 175° F. to 380° F., and most preferably in the range of 180° F. to 275° F., is applied to book 135 for a period of 10 to 25 minutes with a ram pressure that varies depending upon sheet size or the ram size of the laminator 40, but which is typically approximately 1000 p.s.i. with an 18 inch diameter ram. The laminator 40 is then caused to execute a chill cycle, preferably with a corresponding increase in ram pressure. For example, the chill temperature may be in the range of 40° F. to 65° F. and last for a period of 10 to 25 minutes. A ram pressure increase of approximately 25% over the pressure used for the heat cycle has been found to be most preferable.

Subsequent to the above described second lamination cycle as illustrated in FIG. 10, a sheet of plastic card stock is provided which comprises at least core 33 with at least one surface 34,35 thereof covered by a layer of ink 36, and with at least one surface 34,35 thereof covered by a layer of overlaminate film 38, 39. Preferably plastic card stock manufactured in accordance with the present invention comprises core 33 covered on both surfaces 34,36 with a layer of ink 36 which is positioned between layers of overlaminate film 38,39, all of which has been laminated together as described. One or more cards 10 then may be cut from the resulting plastic card stock and card 10 will have a thickness in the range of 0.028 inches to 0.032 inches with variation in overall thickness across the surfaces 12, 14 thereof being no greater than approximately 0.0005 inches. The one or more cards 10 can thus be said to have a surface smoothness of approximately 0.0005 inches or better. Thus, a card 10 manufactured in accordance with the present invention includes at least one surface 12,14 or preferably both surfaces 12,14 that are sufficiently smooth and regular to receive dye sublimation printing.

Those skilled in the art will recognize that the foregoing description has set forth the preferred embodiment of the invention in particular detail and it must be understood that numerous modifications, substitutions, and changes may be undertaken without departing from the true spirit and scope of the present invention as defined by the ensuing claims.

What is claimed is:

1. A process for incorporating at least one electronic element in the manufacture of a plastic card, comprising the steps of:

(a) providing first and second plastic core sheets;

(b) positioning said at least one electronic element in the absence of a non-electronic carrier directly between said first and second plastic core sheets to form a core, said plastic core sheets defining a pair of inner and outer surfaces of said core;

(c) positioning said core in a laminator apparatus, and subjecting said core to a heat and pressure cycle, said heat and pressure cycle comprising the steps of:

(i) heating said core for a first period of time;

(ii) applying a first pressure to said core for a second period of time such that said at least one electronic element is encapsulated by said core;

(iii) cooling said core while applying a second pressure to said core,

(d) coating at least one of said outer surfaces of said core with a layer of ink; and

(e) applying a layer of overlaminate film to at least one of said outer surfaces of said core.

2. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said laminator apparatus has first and second laminating plates, at least one of said first and second laminating plates having a matte finish for creating a textured surface on at least one of said outer surfaces of said core.

3. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 2, wherein each of said first and second laminating plates has a matte finish for creating said textured surface on both of said outer surfaces of said core.

4. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said first and second plastic core sheets are made from a material selected from the group consisting of polyvinyl chloride, polyester, and acrylonitrile-butadiene-styrene, each of said sheets having a thickness in the range of 0.007 to 0.024 inch.

5. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 4, wherein said first and second plastic core sheets have a thickness of approximately 0.0125 inch.

6. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said second pressure is greater than said first pressure.

7. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 6, wherein said second pressure is at least approximately 25% greater than said first pressure.

8. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said core is heated in step (c)(i) to a temperature in the range of 275° F. to 400° F. and said first period of time is at least five (5) minutes.

9. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said first pressure is approximately 1000 p.s.i. and said second period of time is at least 18 minutes.

10. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said step (d) is carried out utilizing a printing press.

11. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said step (d) is carried out utilizing a coating technique selected form the group consisting of silk screen printing, offset printing, letterpress printing, screen printing, roller coating, spray printing, and litho-printing.

12. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 5, wherein said step (e) of applying a layer of overlaminate film comprises the further steps of:

(a) positioning an overlaminate film on at least one ink coated surface of said core;

(b) subjecting said core to a second heat and pressure cycle comprising the steps of:

(i) heating said core to a temperature between approximately 175° F. to 300° F. for approximately 10 to 25 minutes;

(ii) applying approximately 1000 p.s.i. pressure to said core; and

(iii) cooling said core to a temperature in the range of approximately 40° F. to 65° F. for approximately 10 to 25 minutes.

13. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said at least one electronic element is a micro-chip and an associated wire antenna.

14. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said at least one electronic element is a micro-chip and an associated circuit board antenna.

15. The process for incorporating at least one electronic element in the manufacture of a plastic card as recited in claim 1, wherein said at least one electronic element is a read/write integrated chip and an associated antenna.

16. A hot lamination process for the manufacture of plastic cards, said process comprising the steps of:

(a) providing first and second plastic core sheets;

(b) positioning at least one electronic element in the absence of a non-electronic carrier directly between said first and second plastic core sheets to form a layered core;

(c) positioning said core in a laminator apparatus, and subjecting said core to a heat and pressure cycle, said heat and pressure cycle comprising the steps of:

(i) heating said core in said laminator, in the presence of a minimal first ram pressure, to a temperature which causes controlled flow of said plastic which makes up said first and second plastic core sheets;

(ii) applying a second pressure uniformly across said core for encapsulating said at least one electronic element within said controlled flow plastic;

(iii) subsequently cooling said core in conjunction with the concurrent application of a third pressure uniformly across said core, said core including said upper and lower surfaces;

(d) printing on at least one of said upper and lower surfaces of said core such that a layer of ink is applied to at least a portion of said at least one upper and lower surface of said core.

17. The method as recited in claim 16 wherein said first and second core layers are devoid of any appreciable cut-outs.

* * * * *

EXHIBIT 3

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

LEIGHTON TECHNOLOGIES LLC,

Plaintiff,

-against-

OBERTHUR CARD SYSTEMS, S.A., AND OBERTHUR CARD SYSTEMS OF AMERICA CORPORATION,

Defendants.

Case No. 04-CV-02496 (CM)(LMS)

STIPULATION AND ~~PROPOSED~~ ORDER

In an effort to streamline the issues in the case, the parties to this action, Plaintiff Leighton Technologies, Inc. ("Leighton") and Defendants Oberthur Card Systems, S.A. and Oberthur Card Systems of America Corporation (collectively "Oberthur"), have met and conferred regarding (1) the current claims and defenses set forth in the pleadings; and (2) the products accused of infringement. The specific terms of the parties' agreement are set forth below.

In view of this Stipulation, and subject to approval by the Court, the parties have agreed to file amended pleadings which reflect the claims, counterclaims and defenses which are being dismissed or amended. The amended pleadings are attached to this Stipulation and Proposed Order.

Oberthur has represented that to date, it has made, used or sold less than 5,000 "dual mode cards" in the United States, and have not made or sold any "hybrid cards" other than the sale to Sun Microsystems Oberthur already identified to Leighton during discovery. Dual mode cards are cards that have a single chip and both contact and contactless interfaces. Hybrid cards are cards that have two chips, one with a contact interface and the other with a contactless interface.

Oberthur has also represented that it will promptly notify Leighton if at any time prior to the conclusion of trial it makes, uses or sells more than 20,000 dual mode cards or hybrid cards to or on behalf of any customer, including the U.S. government (Oberthur does not in any way concede, however, that U.S. government sales fall within the scope of this case). The notice requirement will be triggered by Oberthur initiating the manufacture of cards to fill an order for more than 20,000 cards. Leighton has reserved its right to assert the '367 and '099 patents in the event that occurs.

I. As a result of these representations, Leighton has decided to dismiss, without prejudice, all causes of action relating to two of the patents in suit, U.S. Patent Nos. 6,514,367 and 6,036,099 ("'367 and '099 patents"), with each party to bear its own costs and fees relating to those causes of action, and to file a Third Amended Complaint. Oberthur does not oppose this dismissal.

II. With respect to certain affirmative defenses and counterclaims set forth in Oberthur's Answer to Leighton's Second Amended Complaint, Oberthur wishes to amend its pleadings as follows, and Leighton while reserving its rights to challenge the merits of the pleadings, does not oppose the amendment that:

a) The Second and Third affirmative defenses of Oberthur are hereby dismissed without prejudice, with each party to bear its own costs and fees relating to those affirmative defenses;

b) The Fifth, Sixth, Seventh, Eighth and Ninth counterclaims of Oberthur for Tortious Interference with Prospective Economic Advantage, Attempted Monopolization, and Restraint of Trade are hereby dismissed without prejudice, with each party to bear its own costs and fees relating to those counterclaims;

c) The First and Second counterclaims for inequitable conduct in the prosecution of the '367 patent and U.S. Patent No. 6,214,155 shall proceed against Leighton (and are not being asserted against former Counterclaim Defendant Keith Leighton in his individual capacity);

d) The Third counterclaim for a declaratory judgment of invalidity and noninfringement is hereby dismissed without prejudice as to Counterclaim Defendants Alexander Poltorak, Paul J. Lerner and Keith Leighton, with Oberthur and each of these Defendants to bear their own costs and fees relating to those counterclaims. The Third counterclaim shall proceed against the non-individual defendants, Defendant Leighton and Counterclaim Defendants General Patent Corporation International, General Patent Corporation, IP Holdings LLC (this stipulation will not be used as a basis for the former individual defendants, Poltorak, Lerner and Leighton, to object to providing discovery in this case);

e) The Fourth counterclaim for patent misuse shall proceed against the non-individual defendants, Defendant Leighton and Counterclaim Defendants General Patent Corporation International, General Patent Corporation, IP Holdings LLC;

III. During any trial of this action, the parties will not discuss, argue or otherwise refer to the causes of action, counterclaims and affirmative defenses dismissed by this stipulation (this does not preclude either party from referring to the dismissed patents during trial to the extent they relate to issues in the case); and

IV. The amended pleadings, including: the Third Amended Complaint; the Answer and Counterclaims to that Complaint; and the Answer to the Counterclaims are attached hereto

as exhibits, and will be filed in the same form upon approval of this Stipulation and Proposed Order by the Court.

STIPULATED AND AGREED TO BY:

Dated: July 20, 2006

LEIGHTON TECHNOLOGIES LLC, GENERAL PATENT CORPORATION INTERNATIONAL, GENERAL PATENT CORPORATION, IP HOLDINGS LLC, ALEXANDER I. POLTORAK, PAUL J. LERNER AND KEITH LEIGHTON

By their attorneys:

Sutherland Asbill & Brennan, LLP
1275 Pennsylvania Avenue, N.W.
Washington, DC 20004-2415
Tel.: 202-383-0100
Fax: 202-637-3593
Robert A. Gutkin, Esq. (Pro hac vice)
Blair M. Jacobs, Esq. (Pro hac vice)
Christina A. Ondrick, Esq. (Pro hac vice)

Dated: July 24, 2006

OBERTHUR CARD SYSTEMS, S.A. and OBERTHUR CARD SYSTEMS OF AMERICA CORPORATION

By their attorneys:

Quinn Emanuel Urquhart Oliver & Hedges LLP
51 Madison Avenue, 22nd Floor
New York, New York 10010
Tel.: 212-849-7000
Fax: 212-849-7100
Edward DeFranco (ED-6524)
Kevin Johnson (KJ-8689)
Robert Juman (RJ-6350)

PURSUANT TO STIPULATION, IT IS SO ORDERED.

Hon. Lisa Margaret Smith
United States Magistrate Judge

EXHIBIT 4

H

Briefs and Other Related Documents

Leighton Technologies LLC v. Oberthur Card Systems, S.A.S.D.N.Y.,2005.

United States District Court,S.D. New York.

LEIGHTON TECHNOLOGIES LLC, Plaintiff-Counterclaim Defendant,

v.

OBERTHUR CARD SYSTEMS, S.A., Defendant-Counterclaim Plaintiff.

No. 04 CIV. 2496(CM).

March 9, 2005.

Background: Suit was brought alleging infringement of patents describing a hot lamination process for manufacturing a "contactless smart card" with an embedded electronic element and an aesthetically pleasing, smooth finished surface that was capable of receiving dye sublimation printing. Defendant denied infringement and contested the validity of the patents.

Holdings: In construing disputed claim terms, the District Court, McMahon, J., held that:

(1) phrase "electronic element," was not susceptible to narrow construction which limited the term to a combination of a microchip and an antenna, and

(2) terms "first," "second" and "third," as used in patent claims referred to the sequential order in which the steps were to be performed.

Claims construed.

West Headnotes

[1] Patents 291 ⇐314(5)

291 Patents
291XII Infringement
291XII(C) Suits in Equity
291k314 Hearing
291k314(5) k. Questions of Law or Fact. Most Cited Cases

Patent claim construction presents a question of law for a judge, not one of fact for a jury.

[2] Patents 291 ⇐101(11)

291 Patents
291IV Applications and Proceedings Thereon
291k101 Claims
291k101(11) k. Process or Method Claims. Most Cited Cases

For process or method claims, patent claim interpretation may involve ascertaining whether the claim may be interpreted to require that the steps be performed in a specific order; test for determining whether the steps included in a process claim must be performed in the recited order require court to look to the claim language to determine if, as a matter of logic or grammar, they must be performed in the order written, and, if not, court next looks to the rest of the specification to determine whether it directly or implicitly requires such a narrow construction.

[3] Patents 291 ⇐165(5)

291 Patents
291IX Construction and Operation of Letters Patent
291IX(B) Limitation of Claims
291k165 Operation and Effect of Claims in General
291k165(5) k. Construction of Particular Claims as Affected by Other Claims. Most Cited Cases

Ordinarily, terms are to be construed so that they have the same meaning throughout a patent.

[4] Patents 291 ⇐157(2)

291 Patents
291IX Construction and Operation of Letters Patent
291IX(A) In General
291k157 General Rules of Construction
291k157(2) k. Construction to Give Validity and Effect to Patent. Most Cited Cases

Courts are to construe claims so as to sustain a patent's validity where possible.

[5] Patents 291 ⇐101(3)

291 Patents
291IV Applications and Proceedings Thereon
291k101 Claims
291k101(3) k. Limitations in General. Most Cited Cases
Phrase "electronic element," as used in patents describing a hot lamination process for manufacturing a "contactless smart card" with an embedded electronic element, could not be construed with reference solely to intrinsic evidence without defining additional terms "semiconductor," "conductor," "insulator," and "electrical;" phrase "electronic element" was not susceptible to narrow construction which limited the term to a combination of a microchip and an antenna.

[6] Patents 291 ⇐165(4)

291 Patents
291IX Construction and Operation of Letters Patent
291IX(B) Limitation of Claims
291k165 Operation and Effect of Claims in General
291k165(4) k. Reading Limitations or Elements Into Claims, or Disregarding Limitations or Elements. Most Cited Cases
A patent is not limited to its disclosed embodiments.

[7] Patents 291 ⇐101(2)

291 Patents
291IV Applications and Proceedings Thereon
291k101 Claims
291k101(2) k. Construction in General. Most Cited Cases
Phrase "non-electronic carrier," as used in patents describing a hot lamination process for manufacturing a "contactless smart card" with an embedded electronic element, meant a holder used for electronic devices to protect them from physical damage, which device was not part of a circuit that utilized a semiconductor device.

[8] Patents 291 ⇐101(2)

291 Patents
291IV Applications and Proceedings Thereon
291k101 Claims
291k101(2) k. Construction in General. Most Cited Cases
Term "directly," as used in patents describing a hot lamination process for manufacturing a "contactless smart card" with an embedded electronic element, meant "in immediate physical contact" in context of claim language "positioning said at least one electronic element in the absence of a non-electronic carrier directly between said first and second plastic core sheets."

[9] Patents 291 ⇐101(2)

291 Patents
291IV Applications and Proceedings Thereon
291k101 Claims
291k101(2) k. Construction in General. Most Cited Cases
Phrase "encapsulated by," as used in patents describing a hot lamination process for manufacturing a "contactless smart card" with an embedded electronic element, meant "enclosed by," and phrase "encapsulating" meant "enclosing."

[10] Patents 291 ⇐101(2)

291 Patents
291IV Applications and Proceedings Thereon
291k101 Claims
291k101(2) k. Construction in General. Most Cited Cases
In the context of language "coating at least one of said outer surfaces of said core with a layer of ink," as used in patents describing a hot lamination process for manufacturing a "contactless smart card" with an embedded electronic element, term "coating" meant "covering."

[11] Patents 291 ⇐101(2)

291 Patents
291IV Applications and Proceedings Thereon
291k101 Claims
291k101(2) k. Construction in General. Most Cited Cases
In the context of language "minimal first nip pressure," as used in patents describing a hot lamination process for manufacturing a "contactless smart card" with an embedded electronic element, word "minimal" meant the smallest or least amount of nip

pressure necessary to accomplish the designated step.

[12] Patents 291 ⇐101(2)

291 Patents
291IV Applications and Proceedings Thereon
291k101 Claims
291k101(2) k. Construction in General. Most Cited Cases
Terms "first," "second" and "third," as used in patent claims referred to the sequential order in which the steps were to be performed in a hot lamination process for manufacturing a "contactless smart card" with an embedded electronic element.

[13] Patents 291 ⇐165(3)

291 Patents
291IX Construction and Operation of Letters Patent
291IX(B) Limitation of Claims
291k165 Operation and Effect of Claims in General
291k165(3) k. Construction of Language of Claims in General. Most Cited Cases

Patents 291 ⇐167(1)

291 Patents
291IX Construction and Operation of Letters Patent
291IX(B) Limitation of Claims
291k167 Specifications, Drawings, and Models
291k167(1) k. In General. Most Cited Cases

Patents 291 ⇐168(2.1)

291 Patents
291IX Construction and Operation of Letters Patent
291IX(B) Limitation of Claims
291k168 Proceedings in Patent Office in General
291k168(2) Rejection and Amendment of Claims
291k168(2.1) k. In General. Most Cited Cases

Where the language of the claim, the specification, and the prosecution history logically indicate a sequential process, recited steps in a claim must be read to require a sequential order.

[14] Patents 291 ⇐101(6)

291 Patents
291IV Applications and Proceedings Thereon
291k101 Claims
291k101(6) k. Ambiguity, Uncertainty or Indefiniteness. Most Cited Cases
Courts interpreting patents routinely avoid indefiniteness by interpreting language to provide for an antecedent basis.

[15] Patents 291 ⇐101(2)

291 Patents
291IV Applications and Proceedings Thereon
291k101 Claims
291k101(2) k. Construction in General. Most Cited Cases
Phrase "controlled flow," as used in patents describing a hot lamination process for manufacturing a "contactless smart card" with an embedded electronic element, meant regulated and directed forward continuous movement.

[16] Patents 291 ⇐101(2)

291 Patents
291IV Applications and Proceedings Thereon
291k101 Claims
291k101(2) k. Construction in General. Most Cited Cases
Phrase "cooling said core while applying a second pressure," as used in patents describing a hot lamination process for manufacturing a "contactless smart card" with an embedded electronic element, meant cooling said core during the time that a second pressure is applied.

[17] Patents 291 ⇐101(2)

291 Patents
291IV Applications and Proceedings Thereon
291k101 Claims
291k101(2) k. Construction in General.

Most Cited Cases
Phrase "cooling said core in conjunction with the concurrent application of a third pressure," as used in patents describing a hot lamination process for manufacturing a "contactless smart card" with an embedded electronic element, meant "cooling said core while at the same time applying a third pressure."

[18] Patents 291 ⟹101(2)

291 Patents
291IV Applications and Proceedings Thereon
291k101 Claims
291k101(2) k. Construction in General.
Most Cited Cases
Phrase "plastic core sheets," as used in patents describing a hot lamination process for manufacturing a "contactless smart card" with an embedded electronic element, meant sheets of plastic between which the electronic element is positioned.

[19] Patents 291 ⟹101(2)

291 Patents
291IV Applications and Proceedings Thereon
291k101 Claims
291k101(2) k. Construction in General.
Most Cited Cases
Phrase "laminator apparatus," as used in patents describing a hot lamination process for manufacturing a "contactless smart card" with an embedded electronic element, meant equipment that is used to unite two or more layers of material, such as the core, by the application of heat and pressure.

[20] Patents 291 ⟹101(2)

291 Patents
291IV Applications and Proceedings Thereon
291k101 Claims
291k101(2) k. Construction in General.
Most Cited Cases
Term "milling," as used in patents describing a hot lamination process for manufacturing a "contactless smart card" with an embedded electronic element, meant using a machine to remove.

Patents 291 ⟹328(2)

291 Patents
291XIII Decisions on the Validity, Construction, and Infringement of Particular Patents
291k328 Patents Enumerated
291k328(2) k. Original Utility. Most Cited Cases
4,450,024, 5,519,201. Cited as Prior Art.

Patents 291 ⟹328(2)

291 Patents
291XIII Decisions on the Validity, Construction, and Infringement of Particular Patents
291k328 Patents Enumerated
291k328(2) k. Original Utility. Most Cited Cases
5,817,207, 6,036,099, 6,214,155, 6,514,367. Construed.

*363 Blair M. Jacobs, Robert A. Gutkin, Sutherland, Asbill & Brennan, L.L.P., Washington, DC, Joseph Fiorani, Patrick L. Parker, Valeria Calafiore, Patrick Lee Parker, Clifford Chance US LLP, New York, NY, for Plaintiff.
Frank Michael Gasparo, Baker & McKenzie (NY), New York, NY, for Defendant/Claimant.
James David Jacobs, Baker and McKenzie, New York, NY, for Claimant.

*364 DECISION CONSTRUING DISPUTED CLAIM TERMS(Markman Decision)
MCMAHON, District Judge.
This is a patent infringement case.

Plaintiff, Leighton Technologies LLC ("Leighton"), owns U.S. Patent Nos. 5,817,207, 6,036,099, 6,214,155 and 6,514,367 (collectively, the "Patents" or "patents in suit"). All four Patents relate to radio frequency identification ("RFID") technology, which is the basis for the so-called "smart card," a plastic card that includes an electronic element (such as a computer chip) and a reader, and that is used in numerous common applications including security swipe cards, credit/debit cards, mass transit access, toll collection (EZ-Pass), and government identification. (Plaintiff's Brief in Support of its Claim Construction, dated Nov. 5, 2004 ("Pl. Br.") at pp. 1, 3-4.)

Smart cards come in three forms. As the name suggests, a "contactless" smart card transmits a signal when it is placed near the reading device, even if the card is contained in a purse or wallet. A "contact" smart card requires contact between a magnetic strip on the card and the reading device. A "dual function" card works with or without contact. (*See* Defendant Oberthur Card Systems, S.A. *Markman* Brief, dated Nov. 5, 2004 ("Def. Br.") at p. 3.) Contactless and dual function smart cards all contain a computer chip and antenna, one or both of which are encapsulated between plastic sheets. (*See, e.g.*, '207 patent; '989 patent.) In addition to an embedded electronic element, dual function cards also have an exposed electronic surface to facilitate contact transmission. (*See, e.g.*, '292 patent; '367 patent.)

The Patents describe processes for making smart cards. Specifically, they claim the use of a "highly coordinated" lamination process involving heat, cooling and the application of pressure to encapsulate an electronic component that is essential to signal transmission between two plastic sheets to form contactless and dual function smart cards. (Pl. Br. at 1, 4.) The Patents allegedly improve over prior art by eliminating the need to create a protective barrier around the embedded electronic element, thereby uncomplicating the manufacturing process. Plaintiff's process also produces a card with a surface smooth enough to receive dye sublimation printing. (*See, e.g.*, '207 patent, Abstract; Def. Br. at 5-6 (citing the 60,005,685 provisional application that matured into the '207 patent); Pl. Br. at 1, 9.)

Defendant Oberthur Card Systems, S.A. ("Oberthur") also manufactures smart cards. Plaintiff alleges that Defendant and its subsidiaries knew about and infringed the Patents in Oberthur's manufacturing processes. (Pl. Br. at 1.) Defendant denies infringement and contests the validity of Plaintiff's Patents, noting that "chip" cards, including contactless and dual function smart cards, have been manufactured using lamination techniques for years prior to the Patents, and that lamination has long been a well-known procedure for bonding card layers using heat and pressure. (Def. Br. at 4.)

[1] Before reaching the issues of validity and infringement, this Court must construe the claims. This function has resided with the Court since the Federal Circuit decided, in *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 978-79 (Fed.Cir.1995), *aff'd* 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996), that claim construction presented a question of law for a judge, not one of fact for a jury.

Leighton has identified 36 claims in the Patents requiring construction: claims 1, 6, 7, 8, 11, 14-16 of the '207 patent; claims 1, 6, 7, 8, 12-15 of the '155 patent; claims 1, 6, 7, 9, 12, 14-16 of the '009 patent; and claims 1, 6, 9, 12, 15-17, 19-23 of the '367 '365 patent. (Pl. Br. at 13). The parties agree on the meaning of most of the terms used in the Patents. The fourteen disputed terms in these claims requiring construction are: (1) "electronic element" (Def. Br. at 2; Pl. Br. at 13); (2) "non-electronic carrier" (Def. Br. at 2; Pl. Br. at 13); (3) "directly" (Def. Br. at 2; Pl. Br. at 13); (4) "comprising the steps of" (Def. Br. at 2); (5) "encapsulated by/encapsulating" (Def. Br. at 2); (6) "coating at least one of said outer surfaces of said core with a layer of ink" (Def. Br. at 2; Pl. Br. at 13); (7) "minimal first ram pressure" (Def. Br. at 2); (8) "first pressure, second pressure, third pressure" (Def. Br. at 2); (9) "controlled flow" (Def. Br. at 2); (10) "cooling said core while applying a second pressure" (Def. Br. at 2); (11) "cooling said core in conjunction with the concurrent application of a third pressure" (Def. Br. at 2); (12) "plastic core sheets" (Pl. Br. at 13); (13) "laminator apparatus" (Pl. Br. at 13); and (14) "milling" (Pl. Br. at 13).

Principles of Claim Construction

Certain principles deeply embedded in patent law guide the court in claim construction.

The meaning of a claim should be interpreted, if at all possible, in light of the intrinsic evidence: the claim language itself, the specification contained in the patent and the patent's prosecution history. *Markman*, 52 F.3d at 979. The intrinsic evidence constitutes the public record of the patent on which the public is entitled to rely. *Id.* If the intrinsic evidence is sufficient to resolve the meaning of a disputed term, it is improper to resort to extrinsic evidence, such as expert testimony or treatises, in construing claim lan-

guage. *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1583 (Fed.Cir.1996). Only if intrinsic evidence is insufficient to resolve an ambiguity in a disputed claim term may a court resort to extrinsic evidence. *CVI/Beta Ventures, Inc. v. Tura L.P.*, 112 F.3d 1146, 1153 (Fed.Cir.1997).

To define the scope of the patented invention, the Court must look first at the words of the claims themselves. *Vitronics Corp.*, 90 F.3d at 1582 (citing *Bell Communications Research, Inc. v. Vitalink Communications Corp.*, 55 F.3d 615, 620 (Fed.Cir.1995)). Words in the claim are generally given their ordinary and customary meaning as understood by someone skilled in the art. However, "a patentee may choose to be his own lexicographer" and assign special definitions to the words in the claim, as long as those definitions are clearly stated in the patent specification or file history. *Id.* (citing *Hoechst Celanese Corp. v. BP Chems. Ltd.*, 78 F.3d 1575, 1578 (Fed.Cir.1996)). Therefore, "it is always necessary to review the specification to determine whether the inventor has used any terms in a manner inconsistent with their ordinary meaning. The specification acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication." *Id.* (citing *Markman*, 52 F.3d at 979). The Federal Circuit has stated that "claims must be read in view of the specification, of which they are a part." *Id.* (citing *Markman*, 52 F.3d at 979); *see also Gart v. Logitech, Inc.*, 254 F.3d 1334, 1341 (Fed.Cir.2001) ("It is certainly correct that the specification and the prosecution history should be consulted to construe the language of the claims."). Because the specification must contain a description sufficient to enable those of ordinary skill in the art to make and use the invention, the specification "is the single best guide to the meaning of a disputed term." *Vitronics*, 90 F.3d at 1582.

The Court also may consider the prosecution history of the patent. *Id.* (citing *Markman*, 52 F.3d at 980; **366Graham v. John Deere*, 383 U.S. 1, 33, 86 S.Ct. 684, 15 L.Ed.2d 545 (1966)). The prosecution history is the complete record of the proceedings before the Patent and Trademark Office. During the course of these proceedings, the applicant may have made express representations regarding the scope of the invention, so the prosecution history is "often of critical significance to determining the meaning of the claims." *Id.* (citing *Markman*, 52 F.3d at 980; *Southwall Tech., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1576 (Fed.Cir.1995)). Claim terms may appear to contain plain language, but the prosecution history may demonstrate that the claims do not cover some matters that would otherwise be encompassed in the plain meaning of the words used. Prosecution histories often contain an analysis of the distinctions between the prior art and the applicant's claims, providing the Court with clues to limitations of the claims. *Id.* at 1578; *Autogiro Co. of America v. United States*, 181 Ct.Cl. 55, 384 F.2d 391, 399 (1967). Furthermore, "the prosecution history limits the interpretation of claim terms so as to exclude any interpretation that was disclaimed during prosecution." *Southwall Tech., Inc.*, 54 F.3d at 1576. Even when the written description would otherwise support a construction, the prosecution history, which is generated afterwards, can relinquish coverage of a claimed embodiment. *Rheox, Inc. v. Entact*, 276 F.3d 1319, 1325-27 (Fed.Cir.2002).

[2] For process or method claims like the ones at issue here, claim interpretation may involve ascertaining whether the claim may be interpreted to require that the steps be performed in a specific order. *Interactive Gift Express, Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1342 (Fed.Cir.2001). The Federal Circuit recently crafted a two-part test, both prongs of which involve only intrinsic evidence, to determine whether the steps included in a process claim must be performed in the recited order:

First, we look to the claim language to determine if, as a matter of logic or grammar, they must be performed in the order written ... If not, we next look to the rest of the specification to determine whether it "directly or implicitly requires such a narrow construction."

Altiris, Inc. v. Symantec Corp., 318 F.3d 1363, 1369-70 (Fed.Cir.2003) (internal citations omitted).

[3][4] Ordinarily, terms are to be construed so that they have the same meaning throughout a patent. *Southwall Technologies, Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1574 (Fed.Cir.1995). Finally, claim lan-

guage should be read in a manner that causes the claim to make sense; courts are to construe claims so as to sustain a patent's validity where possible. *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577 (Fed.Cir.1984).

Background of the Patents At Issue

In this case, there are four patents in suit.

The '207 patent describes a hot lamination process for manufacturing a "contactless smart card" with an embedded electronic element and an aesthetically pleasing, smooth finished surface that is capable of receiving dye sublimation printing. *See, e.g.*, '207 patent, Abstract, Ex. 1 to Declaration of James David Jacobs, dated Nov. 5, 2004 ("Jacobs Decl."). Noting increased credit card and ATM fraud, the Background of the Invention for the '207 patent elaborates that this particular type of smart card-with its embedded computer chip that is capable of storing information about the holder-is intended to fill "a need in the plastic card industry to provide a more secure plastic card that is very difficult or impossible to fraudulently manipulate." '207 patent, col. 1:52-54. To that end, the '367 embedded electronic element "may perform a wide variety of functions and take a wide variety of forms." '207 patent, Detailed Description of the Invention, col. 3:35-37. In addition, the process described in the '207 patent (which yields a card that complies with all industry standards and specifications) is not as expensive or difficult as other smart card processes, and produces a more aesthetically pleasing card than prior patented processes-i.e., a thinner, smoother card that can receive dye sublimation and so does not reveal its embedded computer chip. '207 patent, col. 1:58-col. 2:13.

Claim 1 of the '207 patent (an independent claim) is representative of the content of most of the disputed terms at issue in this suit (bolded):[FN1]

> FN1. The parties do not cite to the same sections of the Patents for the content of the disputed terms, however neither party appears to contest the content relied upon by the other. Plaintiff, for example, cites to the '207 and '092 patents in the beginning of its brief, and indicates that the content is representative of the '155 and '367 patents, respectively. (*See, e.g.*, Pl. Br. at 4, n. 4.) This would appear to be accurate; as discussed below, the Patents are all continuations or continuations-in-part of the '207 patent. Therefore, for purposes of this *Markman* decision, I will refer to the Patents where possible, and to the briefs where necessary to avoid confusion.

A process for incorporating at least one electronic element in the manufacture of a plastic card, comprising the steps of: (a) providing first and second plastic core sheets; (b) positioning said at least one electronic element in the absence of a non-electronic carrier directly between said first and second plastic core sheets to form a core, said plastic core sheets defining a pair of inner and outer surfaces of said core; (c) positioning said core in a laminator apparatus, and subjecting said core to a heat and pressure cycle, said heat and pressure cycle comprising the steps of: (i) heating said core for a first period of time; (ii) applying a first pressure to said core for a second period of time such that said at least one electronic element is encapsulated by said core; (iii) cooling said core while applying a second pressure to said core; (d) coating at least one of said outer surfaces of said core with a layer of ink; and (e) applying a layer of overlaminate film to at least one of said outer surfaces of said core.
'207 patent, col. 6:15-40. (*See also* Declaration of Neil G. Cohen in Support of Plaintiff's Brief in Support of Its Claim Construction ("Cohen Decl."), Vol. 2 at L2-4.)

Claim 16 of the '207 patent (also an independent claim) includes in the first chronological step of the heat and pressure cycle the following additional instruction, which incorporates additional disputed terms:
(i) heating said core in a laminator, in the presence of a subatmospheric first ram pressure, to a temperature which causes controlled flow of said plastic which makes up said first and second plastic core sheets; (ii) applying a second pressure uniformly across said core for encapsulating said at least one electronic element within said controlled flow plastic; (iii) sub-

sequently cooling said core in conjunction with the concurrent application of a third pressure uniformly across said core.

'207 patent, col.8: 12-32.

In plain English, the '207 patent teaches that an electronic element is positioned between plastic sheets to form a "core." The specification acknowledges that these "electronic elements ... and their insertion into plastic cards is not new, however, the present invention provides a new hot *368 lamination process for manufacturing plastic cards ... with these electronic elements." '207 patent, col. 3:53-62. (*See also* Pl. Br. at 4.) Specific disclosed examples of the electronic element include microchips connected to various types of antennae and "any other suitable electronic element." '207 patent, col. 3:48-52. During oral argument at the *Markman* hearing, the court likened this "core" to a sandwich, in which the plastic sheets were the pieces of bread and the electronic element was the filling.

Once created, the plastic core "sandwich" is then placed in a laminator between upper and lower "platens," one of which is movable. The laminator heats, cools and applies hydraulic pressure to the core via intermediate layers consisting of "laminating pads" and "steel plates." *Id.* at col. 4:22-40. (*See also* Pl. Br. at 5.) The core and the intermediate layers form a "book." '207 patent, col. 4:33-40.

A first lamination cycle is initiated by closing the laminator platens and applying little or no pressure to the book. '207 patent, col. 4:41-44. A heat cycle is initiated to bring the temperature of the platens up for a predetermined period of time (e.g., 275-400° F for more than 5 minutes). '207 patent, col. 4:44-48. (*See also* Pl. Br. at 5.) The pressure of the laminator is then increased to facilitate the flow of the plastic core sheets to encapsulate the electronic element within the sheets. '207 patent col. 4:48-54. (*See also* Pl. Br. at 5.) The pressure cannot be too great or it will damage the electronic elements.

The laminator then applies a chill cycle to the book in which the pressure of the laminator is increased until the platens have cooled to a predetermined temperature for a predetermined period of time (e.g., approximately 40-65° F for approximately 10-15 minutes). '207 patent, col. 4:66-5:5. (*See also* Pl. Br. at 5-6.)

The core is then removed from the laminator, whereupon it may be coated on at least one of its outer surfaces with a layer of ink. '207 patent, col. 5:6-12. A clear layer of overlaminate film may be applied to the ink-coated core. *Id.* at col. 5:25-31. Individual cards may be cut out from the laminated core. *Id.* at col. 5:67-6:4.

The '155 patent application was filed approximately two years after the '207 application. (*See* Def. Br. at 10.) The '155 patent application is a continuation of the '207 patent application and duplicates in all substantive respects the '207 patent specification. (*Id.*) The similarities between the '155 and '207 patents are substantial. Looking just at the independent claims: claim 1 of each is identical, except that claim 1 of the '155 patent omits the ink-coating step; and claim 15 of the '155 patent is the same as claim 16 of the '207 patent, except that claim 15 of the '155 omits the printing step. The lamination process claimed in the '207 and '155 patents, including the serial steps of heating, cooling and applying pressure, is identical. (*Id.*)

Leighton filed the application that matured into the '099 patent approximately 10 months after filing the application that matured into the '207 patent. The '099 patent is a continuation-in-part of the '207 patent application. (*Id.* at 8.) Whereas the '207 patent is directed to the hot lamination process for creating a contactless card, the '099 patent is directed to a dual function card-a combination contact/contactless card. (*Id.*) Despite the fact that the patents relate to different types of cards, the specifications of the '207 and '099 patents share virtually the same disclosure. There is, however, an additional step involved in creating the dual function card, which includes the last group of additional terms: "milling a region of said core to a controlled depth so as to form a cavity which exposes at least *369 one contact pad of said electronic element," and "inserting a second electronic element into said cavity, the second electronic element being in electrical communication with the at least one electronic element." '099 patent, col.

9:3-5, col. 10:17-19; *see also* '367 patent, claims 1, 22, 23.

This additional step allows for placement of a second electronic element into the cavity to facilitate the contact function of a dual function card.

Leighton filed the application that matured into the '367 patent approximately three years after the '207 application, and approximately two years after filing the application for the '099 patent. (*See* Def. Br. at 11.) The '367 patent application is a continuation of the '099 patent and, except with respect to matters not relevant here, the specifications are identical. (*Id.*) It is also a continuation-in-part of the '207 patent. The '367 patent, like the '099 patent, describes a hot lamination process for creating a dual function contact/contactless smart card, and so it contains the "milling" step and insertion of a second electronic element as in the '099 patent.

The main difference between the contactless card process (the '207 and '155 patents) and the dual function card process (the '099 and '376 patents) appears to be that one or more electronic elements are embedded during lamination in the plastic core sheets in the process described by the former patents, whereas in the latter patents, in addition to that embedding, another electronic element is inserted into a milled cavity after lamination to allow the card to function in either a contact or contactless mode. (*See, e.g.*, Pl. Br. at 10, describing Figures 1 and 2 of the '099 patent.)

Significantly, there is nothing-no container, no recess and no physical buffer of any sort-that protects the embedded electronic element during lamination in any of the Patents at issue here-whether a micro-chip and antennae, or just an antenna. *See, e.g.*, '207 patent, col. 6:23-25. Both parties acknowledge that the absence of a "buffer" or "buffer zone" is the critical improvement of these patents over prior art, specifically over U.S. Patent No. 4,450,024, which acquired protection for the electronic element during lamination. *See, e.g.*, '024 patent, col. 6:60-7:8.

Indeed, the Patent Office initially rejected application Claims 1-19 of the '207 patent as being obvious over the '024 patent. (Pl. Br. at 19.) Claim 1 of the '207 patent originally recited:

1. A hot lamination process for the manufacture of a plastic card, said process comprising the steps of: (a) providing first and second plastic core sheets; (b) positioning at least one electronic element between said first and second plastic core sheets to form a layered core.

(*Id.*) In response to the Patent Office's rejection, the bolded language was modified to read, "electronic element *in the absence of a non-electronic carrier directly* between said first and second plastic core sheets..." (*Id.* (emphasis added).) This modified language appears in each of the four Patents, to reflect this same improvement. In distinguishing the '207 patent from the '024 patent, Leighton noted that the '024 patent required that the "electronic element ... be placed in a protective carrier disk," which protection is not necessary in the '207 patent (or any of the Patents at issue in this case). (Pl. Br. at 20.) Thus, Leighton's modification of the language indicated that the '207 patent-and the rest of the Patents-improved on the '024 patent by eliminating the need to specifically protect the electronic element during lamination.

Construction of the Disputed Terms

With one key exception, Oberthur and Leighton agree that all the terms should "370 be defined in the same way across all four related Patents. Oberthur believes that the term "electronic element" cannot be defined in the same manner for the '367 and '099 patents as it is for the '207 and '155 patents-and, indeed, argues that it cannot be defined at all for the former patents. I disagree.

1. "Electronic Element"

[5] This term will be defined as "a device or thing that has (1) distinct characteristics related to electricity, together with (2) terminals at which it may be connected to other distinctly electrical devices or things in order to form a circuit (3) in which electrons move through devices called semiconductors."

The phrase "electronic element" appears in claim 1 of each of the four Patents: "A process for incorporating at least one electronic element in the manufacture of

a plastic card ... positioning said at least one electronic element in the absence of a non-electronic carrier directly between said first and second plastic core sheets to form a plastic core..." '207 Patent, Claim 1; '155 Patent, Claim 1; '999 Patent, Claim 1; '367 Patent, Claim 1; '367 Patent, Claim 20. (*See also* Cohen Decl., Exh. L.)

It also appears in the following language of the '207 and '155 patents: "[P]ositioning at least one electronic element in the absence of a non-electronic carrier directly between said first and second plastic core sheets..." '207 Patent, claim 16 and '155 Patent, Claim 15. (*See also* Cohen Decl., Exh. L.) "Electronic element may take a wide variety of forms and perform a wide variety of functions. As shown ... electronic element may be provided by a micro-chip and a circuit board antenna, a read/write micro-chip and a wire coil antenna, or any other suitable electronic elements." '207 Patent, Specification, col. 3:46-52 (internal references omitted).

The specification of the '999 patent states that the "electronic element may take a wide variety of forms (microprocessor chip, circuit board, transponder, etc.)." (Pl. Br. at 15-16, quoting the '999 Patent at col. 4:35-37.)

Plaintiff urges that an "electronic element" in all of the patents in suit should be construed to mean "a device having distinct electrical characteristics and having terminals at which it may be connected to other elements to form a circuit that utilizes a semiconductor device." (Pl. Br. at 14).

Defendant urges that the term be construed to mean "A microchip and an antenna" in the '207 and '155 patents. Defendant further contends that the term is ambiguous in the context of the '999 and '367 patents, and thus cannot be defined at all.

Because this is the most hotly contested term, and its definition is critical to the construction of the patents, I will summarize the parties' arguments in some detail. *Definitional Sources:*

Plain Meaning: Both parties place great reliance on dictionary definitions. Yet while using the same dictionary, they come up with two different "plain" meanings for this key phrase.

Plaintiff notes that the Dictionary of Scientific and Technical Terms (McGraw Hill 5th ed. 1994) ("McGraw Hill") does not contain a definition for the phrase "electronic element." But it does define both the word "electronic" and the word "element." [FN2] So Plaintiff puts those two definitions together and argues that the "definitions of the words that make up this term '371 provide a clear ordinary meaning." (Pl. Br. at 14).

> FN2. Both parties agree on the use of the McGraw Hill Dictionary of Scientific and Technical Terms.

Plaintiff cites to the definition the word "element," as "component," which in turn is defined as, "any electric device ... having distinct electrical characteristics and having terminals at which it may be connected to other components to form a circuit." *Id.* at 624. McGraw Hill defines "electronic" as "[p]ertaining ... to circuits ... utilizing electron devices ..." *Id.* at 661, and defines "electron device" as "a device in which conduction is principally by electrons moving through a vacuum, gas, or semiconductor." *Id.* at 660. Observing that vacuum and gas conduction are irrelevant to the patents in suit, Plaintiff notes that McGraw Hill defines the term "semiconductor device" as an "electronic device in which the characteristic distinguishing electronic conduction takes place within a semiconductor." *Id.* at 1780. (McGraw Hill (6th ed.2003), p. 1895 also defines "semiconductor" to mean, "A solid crystalline material whose electrical conductivity is intermediate between that of a conductor and an insulator, ranging from about 10^{5} mhos to 10^{-7} mho per meter, and is usually strongly temperature-dependent." Plaintiff makes no reference to this definition.)

Defendants agree with Plaintiff's definition of the word "electronic" and also with Plaintiff's observation that the word "element" is synonymous with "component." But taking off from that, they observe that McGraw Hill-while lacking a definition for the phrase "electronic element"-does contain a definition for the phrase "electronic component." And it is not the same as the combined definition of the words

"electronic" and "element" crafted by Plaintiff. Rather, "electronic component" means, "A component which is able to amplify or control voltages or current without mechanical or other non-electrical command, or to switch currents or voltages without mechanical switches; examples include electron tubes, transistors, and other solid-state devices." McGraw Hill at 701. Defendant argues that this is superior to a definition that combines the separate definitions for the terms "electronic" and "component" because, *inter alia*, the term "component" as defined by McGraw Hill relates to the wrong field-Electricity as opposed to Electronics-and is therefore not apt.[FN3]

FN3. I find it interesting that McGraw Hill contains no definition for the term "element"-the admitted synonym for "component" (and the word Leighton actually uses in the patent)-that falls within the field of Electronics, either. Indeed, the "element-component" synonym that Defendant invokes in order to turn my attention to the phrase "electronic component" (which is not the phrase used in the patent) is found under the heading Electricity, not Electronics, which turns Defendant's argument back on itself!

It is important to Defendant that I prefer the definition of "electronic component" over Plaintiff's combined definition of the separate terms "electronic" plus "component" because the definition of "electronic component" incorporates (and, according to Defendant, is limited to) "solid-state devices." That term is defined by McGraw Hill to mean, "A device, *other than a conductor*, which uses magnetic, electrical and other properties of solid materials, as opposed to vacuum or gaseous devices." The italicized language (which appears to limit "electronic components" to solid-state devices, such as microchips) is critical to Defendant for two reasons. First, Defendant argues that the only solid state device that satisfies the criteria of the patent is a micro-chip. Second, in the '099 and '367 patents, a bare antenna, which is a conductor (and thus not a solid state device), is embedded. It is that, Defendant argues, which renders the term "electronic element" indefinable in connection with those two patents.

*373 The fact that both parties agree that the word "component" is synonymous with the patentee's chosen word "element," and that there is a definition for the phrase "electronic component" in McGraw Hill, might be thought to solve the definitional conundrum. Indeed, there is a certain Occam's Razor kind of elegance to Defendant's point.

However, there are two serious flaws with this argument. First, defining "electronic element" to exclude a conductor, like an antenna, reads a disclosed embodiment (in the case of the '099 patent, the preferred embodiment) out of the patent. Adopting that definition is thus inconsistent with the rules that claims are to be construed so as to (1) make sense and (2) be consistent with the specifications.

Second, as is so often the case with scientific and technical definitions, Defendant's proposed definition is tautological-that is, it contains the very word ("component") that it purports to define. To be useful to a jury, the construction of the phrase "electronic component" cannot define the word "component" as "a component." [FN4] Since there is no clue within the definition of "electronic component" to what a "component" might be (other than a non-exhaustive list of examples, about which more in a moment), one could only craft a workable definition of "electronic component" by incorporating into it the definition of the undefined word-"component"-that appears elsewhere in the McGraw Hill Dictionary. Of course, Defendant does not want me to do that, because then we would end up with Plaintiff's definition (or its functional equivalent)!

FN4. Since Defendant insists (and Plaintiff agrees) that "component" is synonymous with "element," I could turn to yet another dictionary-the Oxford English Dictionary, which is used by persons not skilled in any art except the art of looking up words-and find a definition of "element" that fits quite nicely into the language of the patent: "a constituent part." However, that definition would be far too broad to fit within Plaintiff's claimed invention (see below at 374-375).

What should be obvious from all of the above is that I cannot fashion a so-called "ordinary meaning" definition of the term "electronic element" by using a dictionary alone. Nor should I. When interpreting terms used in a patent, one is required to look at how the term is used in the patent itself and in its prosecution history, to see if that use is consistent or inconsistent with any dictionary definition. It is to that exercise that we now turn.

Specifications: The specifications for the '207 patent certainly do not suggest that the term "electronic element" should be defined as narrowly as Defendant urges. For example, it says:
Electronic element 20 may take a wide variety of forms and perform a wide variety of functions...[It may include] a micro-chip 22 including a wire antenna 24 connected thereto, a micro-chip 22 and a circuit board antenna 24 , a read/write micro-chip 22 and a wire coil antenna 24 , or any other suitable electronic element.

Similarly, in the related '099 patent, "Electronic element 20 may take a wide variety of forms (microprocessor chip, circuit board, transponder, etc.)." And as noted above, Fig. 4, one of the disclosed embodiments of the '099 patent, shows the electronic element to be a bare antenna.

Plaintiff has specifically disclaimed to the court any effort to invoke patent rights in whatever the "electronic element" might be. However, Plaintiff's use of broad language in the specifications clearly evinces an attempt to include any sort of electronic element that presently can or might in the future be usefully implanted in a smart card-not just micro-chips and antennas, '373 which appear to be the preferred embodiment given today's technology.

[6] Defendant correctly notes that all of the disclosed embodiments in the '207 and '155 patents are variations on the "micro-chip plus antenna" theme, and all the disclosed embodiments in the '099 and '367 patents are variations on the "micro-chip or antenna" theme. But it is hornbook law that a patent is not limited to its disclosed embodiments. *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 906 (Fed.Cir.2004) (unless patentee specifically indicates such a limitation, claims should not be construed as limited to embodiments of invention having a particular feature simply because all embodiments disclosed in the specifications share that feature). A review of the file wrapper does not disclose anything suggesting that Leighton ever disclaimed the use of any type of electronic device in connection with its process during the prosecution of the patent, so Oberthur cannot invoke any patent estoppel to limit the patent's scope to the disclosed embodiments.

Plaintiff further argues that construing "electronic element" to mean "micro-chip and antenna" with respect to the '207 and '155 patents would violate the doctrine of claim differentiation. Under this doctrine, each claim in a patent is presumed to have a different scope. *See, e.g., Versa Corp. v. Ag-Bag Int'l Ltd.*, 392 F.3d 1325, 1329-30 (Fed.Cir.2004). "The difference in meaning and scope between claims is presumed to be significant '[t]o the extent that the absence of such difference in meaning and scope would make a claim superfluous.' " *Id.* (quoting *Tandon Corp. v. United States Int'l Trade Comm'n*, 831 F.2d 1017, 1023 (Fed.Cir.1987)). Therefore, limitations of dependent claims are not read onto independent claims, because to do so would render the independent claims superfluous as duplicative of the dependent claims.

In the '207 patent, dependent claims 13 and 14 of the '207 patent narrow the scope of the term "electronic element" as it appears in independent claim 1 by specifying that the "electronic element" must be "a micro-chip and an associated wire antenna" (claim 13) or "a micro-chip and an associated circuit board antenna" (claim 14). Defining "electronic element" to mean only "a micro-chip and an antenna" would improperly impose the limitations of dependent claims 13 and 14 onto independent claim 1. Defendant fails to refute this argument.

Prosecution History: Plaintiff also argues that the prosecution history of these patents demonstrates that the term "electronic element" as used in the patents in suit should be read as broadly as Plaintiffs urge-and, moreover, that a person of ordinary skill in the art would so read it.

One of the critical prior art patents is U.S. Patent No.

5,519,201, a prior art patent that is cited in the prosecution history of the '367 patent. This patent relates relate to "smart card" technology. Persons skilled in the art would be expected to be familiar with this patent.

The '201 patent contains the following language concerning the electronics that make smart cards work:
Some identification cards include an integrated circuit and are known as "integrated circuit cards" or "Smart Cards." More generally, herein, 'Smart Card' refers to any portable card-like device which includes one or more electronic components, i.e., active components such as integrated circuits, transistors and diodes, and passive components such as resistors, capacitors and inductors.

Col. 1:32-38.

Elsewhere in the '201 Patent, the inventor states that electronic elements (or components, as he calls them) can include:
integrated circuit modules, transistors, diodes, and passive components such as *374 resistors, inductors and capacitators. Further, an integrated circuit module for use with the invention can be a printed circuit board to which is attached one or more integrated circuit chips, a printed circuit board without an integrated circuit chip attached, or just an integrated circuit chip.

(Pl. Br. at 16, quoting the '201 patent at col. 2:55-64.) This language is extremely broad and does not at all suggest that "electronic elements" in "smart cards" are limited to micro-chips and their antennas.[FN5] Nor does it support Defendant's argument that the term "electronic element" as used in the '367 and '099 patents is indefinable because an antenna-which all parties agree is a "passive component" or an "inductor"-falls outside the ambit of "electronic elements." Defendant urges the Court to read these passages (in particular the former passage) such that only "active components" are encompassed within the reach of the term "electronic components," but such a reading defies logic as well as basic principles of English grammar.[FN6]

FN5. Similarly, the prior art U.S. Patent No. 5,412,192, cited in the provisional application for the '207 patent and teaching a system for changing the activation status of a data card, such as a charge card, uses the phrase "internal electronics" to refer to the "wire coil antenna and micro chip" of the '207 provisional application and defines that phrase in an extremely broad manner to include "battery, fuses, crystal display, and photocell." ('207 Provisional Application at 19).

FN6. The quoted language in the '201 patent also indicates that Defendant's proposed use of the McGraw Hill definition of "electronic component" for the patents in suit is misplaced since it would read out the "passive components" included within the category of "electronic component" used in the '201 patent.

Defendant argues that an antenna cannot possibly be an electronic device because it is an electromagnetic device (according to McGraw Hill), which is something entirely different. However, as noted above, the word "electronic" means "pertaining to electron devices." Antennas "pertain" or relate to "electron devices" by functioning with them to complete the circuitry that embodies the "smart card" technology.

Moreover, the prior art patents draw a distinction between active and passive electronic devices, with the latter plainly including devices that function using electromagnetic action. For example, the '201 patent notes that "electronic components" can include "passive components" such as "inductors," which would encompass antennas. '201 patent, col. 1:32-38.

Result

It is easy to reject Defendant's proposed definition of "electronic element" as "a combination of a microchip and an antenna" with regard to the '207 and '155 patents. Such a construction, as Plaintiff correctly observes, would violate almost every rule of claim construction. It is inconsistent with the broad language used in the specifications. It is inconsistent with prior

art patents that use the same term. And it is far narrower than even the dictionary definition of the phrase "electronic component" that Defendant advances.

It is equally easy to reject Defendant's argument that the term "electronic element" is used differently in the '376 and '299 patents, and cannot be defined at all as used in those patents because one disclosed embodiment identifies something (an antenna) that is not, in fact, an electronic element. Defendant's thesis that this term is used differently in the latter two patents is entirely dependent on acceptance of its extremely narrow construction of the term "electronic element," which "limits that term to a combination of a microchip and an antenna." FN7 Since I *375 have rejected that narrow construction, I must reject the argument based thereon. And the preceding discussion highlights the flaws in Defendant's claim that the term cannot be defined.

> FN7. Specifically, Checkpoint claims that because the '299 patent and '367 patents indicate that the *embedded* "electronic element" is only an antenna-not a micro-chip and antenna-this distinction renders the term ambiguous. (Def. Br. at 51.) Unless the definition of "electronic element" is confined to "microchip and antenna"-an argument I decline to accept-this argument makes no sense.

This leaves me with the task of deciding whether Plaintiff's proposed definition (or some variant on it) is the correct construction of the term, based solely on intrinsic evidence. As I make this decision, I must keep in mind that claim construction is essentially the crafting of a jury instruction, so the term definition must be comprehensible by a lay juror as well as one skilled in the art.

Leighton's proposed definition is "a device having distinct electrical characteristics and having terminals at which it may be connected to other elements to form a circuit that utilizes a semiconductor device." This combines the following definitions (from McGraw Hill):
Electronic: pertaining...to circuits....utilizing electron devices
Electron devices: a device in which conduction is principally by electrons moving through a...semiconductor
Semiconductor Device: an electronic device in which the distinguishing electronic conduction takes place within a semiconductor
Component: any electric device...having distinct electrical characteristics and having terminals at which it may be connected to other components to form a circuit.

Plaintiff's invocation of the McGraw Hill definition of "component" rules out the use of a broader, less technical definition for the word element, such as "a constituent part." This is consistent with the argument made in Plaintiff's brief that, because the word "electronic" modifies "element," the patentee claims use of just one specific type of circuit-one that uses a semiconductor device.

Coupling this with the broad wording of the specification ("Electronic element 20 may take a wide variety of forms....") and the equally broad use of the term electronic element and the analogous term electronic component in critical prior art patents, I conclude that to construe this term with reference solely to intrinsic evidence we must define additional terms (from McGraw Hill):
Semiconductor: a solid crystalline material whose electrical conductivity is intermediate between that of a conductor and an insulator...
Conductor: a wire, cable or other body or medium that is suitable for carrying electric current.
Insulator: a device having high electrical resistance and used for supporting or separating conductors to prevent undesired flow of current from them to other objects.
Electrical: related to or associated with electricity, but not containing or having its properties or characteristics.

I craft the following instruction to give to the jury concerning the phrase "electronic element":
Ladies and gentlemen, the first term that I must define for you is "Electronic element." That is a technical term. The word "electronic" means "pertaining to circuits that use something called electron

devices." An electron device, for the purposes of this patent, is a device or thing in which electrical current is carried ("conducted" is the technical term) principally by electrons moving through something called a '376 semiconductor. So electronic means "pertaining to circuits utilizing a semiconductor device." An "element" is the same thing as a "component," and a "component" is an electrical device (something that has distinct characteristics related to or associated with electricity) and that has terminals, or end points, at which it can be connected to other components to form a "circuit," which is a combination of electrically interconnected components. So "electronic element" means "a device or thing that has distinct characteristics related to electricity, and that also has terminals at which it may be connected to other distinctly electrical devices or things in order to form a circuit, in which electrons move through devices called semiconductors."

2. "Non-Electronic Carrier"

[7] A "non-electronic carrier" means, "A device that holds an electronic element to protect it from physical damage during lamination, where the device is not part of a circuit that utilizes a semiconductor device."

Plaintiff states that the phrase "non-electronic carrier" generally appears in the claims at issue in the following context: "positioning said at least one electronic element in the absence of a non-electronic carrier directly between said first and second plastic core sheets." (Pl. Br. at 18, citing Cohen Decl. at Exh. L, p. 3.) Defendant refers to the same language in claim 1 of the '207 patent. Thus, as noted above, the essence of the Patents is the lack of any "non-electronic carrier."

According to Plaintiff, a "carrier" is defined as a "compartmentalized holder used for storing, transporting, hauling, and testing electronic devices to protect them from physical damage." (Pl. Br. at 18, quoting the Electronic Packaging, Microelectronics, and Interconnection Dictionary ("EPMI Dictionary"), p. 26.) Plaintiff refers to its prior definition of "electronic" as "pertaining to circuits utilizing semiconductor devices," and to Webster's Collegiate Dictionary (10th ed. 1999) ("Webster's"), p. 788, for the definition of "non-" as negating the "usual exp[ecially] positive characteristics" of "electronic." (Pl. Br. at 18.)

Plaintiff also urges that these dictionary meanings should be modified to reflect the prosecution history of the '207 patent, discussed above, during which Leighton clarified that no buffer zone or protection was needed for the embedded electronic element during lamination in any of the Patents. (See discussion supra p. 369.)

Based on the dictionary definitions and the prosecution history, therefore, Plaintiff argues that a "non-electronic carrier" should be construed to mean "a holder used for electronic devices to protect them from physical damage, which device is not part of a circuit that utilizes a semiconductor device." (Id. at 372-373). Plaintiff omits from the dictionary definitions cited above words that it claims would be inaccurate here (i.e., compartmentalized, storing, transporting, hauling, and testing).

Defendant's proposed definition is very similar, and reads, "A structure without any substantial electronic function, such as a recess, buffer or protective carrier, that at least partially protects during lamination the 'electronic element' from damage caused by lamination pressure." (Def. Br. at 22.) Defendant also relies on the prosecution history of the '207 patent to support the idea that the significant difference between the '207 patent and the '024 patent is the fact that the '207 patent does not require protection of the electronic element during the lamination process. (Id.) Defendant additionally concludes-and I agree-that Leighton relinquished any interpretation of "non-electronic carrier" '377 that includes any protection for the electronic element. Southwall Techs., Inc. v. Cardinal IG Co., 54 F.3d 1570 (Fed.Cir.1995). (See Def. Br. at 22.) Defendant notes that Leighton made the same arguments about the absence of protection of the electronic element during prosecution of the '299 patent. (Def. Br. at 52.)

I agree with the parties that Leighton intended to distinguish the Patents at issue here from the '024 patent on the basis of, among other things, the fact that no

protection is needed for the electronic element during lamination in the Patents at issue. Plaintiff's construction of the phrase "non-electronic carrier" addresses this issue without redundancy or ambiguity. I therefore adopt it *in haec verba*.

3. "Directly"

"Directly" means, "in immediate physical contact."

[8] Plaintiff states that "directly" appears in each claim in the following context, "positioning said at least one electronic element in the absence of a non-electronic carrier directly between said first and second plastic core sheets." (Pl. Br. at 21; Cohen Decl., Exh. L.) Defendant refers to the same language in claims 1 and 16 of the '707 patent. (Def. Br. at 25.)

Both parties cite to Webster's for the definition of "directly" as meaning "in immediate physical contact." (Pl. Br. at 21; Def. Br. at 25.) Plaintiff rests on this. Defendant urges additional language, however, defining "directly" to mean that "there is nothing between the 'electronic element' and the first plastic core sheet and nothing between the 'electronic element' and the second plastic core sheet." (Def. Br. at 25.) That just says the same thing in more words that add nothing to the definition. I therefore elect to go with Plaintiff's sparser and more elegant version.

4. "Comprising the Steps Of"

This phrase is-or ought to be-self-explanatory. However, Defendant contends that these words mean that the steps recited in the patent must be performed in the exact order indicated in the patent.

The words themselves admit of no such meaning. "Comprising" means "being made up of," and nothing more than that.[FN8] "Step" means "a stage in a process" (both definitions of these plain English, utterly non-technical words are taken from Webster's New Collegiate Dictionary). Neither of these words necessarily implies that there is any particular order in which the steps must be taken.

FN8. It certainly does not mean "additional," as argued by Plaintiff in its Markman hearing presentation.

Defendant argues that if the steps are not performed in the order indicated, the end product will not be a plastic card with a sufficiently smooth surface to receive dye sublimation printing. (Def. Br. at 29.) That may be or it may not be, but there is nothing in the words "comprising the steps of" that imparts the concept of order. At various points in the patent claims, Plaintiff does use "ordering" language-for example, Leighton's use of the word "subsequently" in claim 15 of the '155 patent and claim 16 of the '207 patent means that step (c)(iii) must follow step (c)(ii). Similarly, the use of words like "following" ('099 patent, claim 8, and '367 patent, claim 7); "prior to" ('367 patent, claims 8 and 14) and "after" ('367 patent, claim 22) expressly indicate that the patentee intended things to flow in a sequential order. In the absence of such language, no order will be presumed. *Altiris Inc. v. Symantec Corp.*, 318 F.3d 1363, 1369 (Fed.Cir.2003).

*378 A variant of Defendant's argument, but a far more interesting one, will be found when we reach the issue of whether the use of the words "first" and "second" in several patent claims fairly implies sequential ordering, or is simply an attempt to distinguish between different applications of pressure without imparting any order. But that is for later discussion.

5. "Encapsulated By and Encapsulating"

[9] The phrase "encapsulated by" is construed to mean, "Enclosed by," and "encapsulating" is construed to mean, "Enclosing."

Plaintiff again argues that the plain meaning of these words suffices to construe them for the jury. I agree.

The phrase "encapsulated by" appears in claim 1 of the '207 patent as follows: "positioning said core in a laminator apparatus, and subjecting said core to a heat and pressure cycle... applying first pressure to said core for a second period of time such that said at least one electronic element is encapsulated by said core." (internal numerical references omitted). *See also* claim 17 of the '099 patent; claim 20 of the '367 patent; claim 1 of the '155 patent. Claim 16 of the '207 patent recites the term in the second step of the

heat and pressure cycle "applying a second pressure uniformly across said core for encapsulating said at least one electronic element within said controlled plastic flow."

Defendant proposes that the phrase means:

that the 'core' must fully enclose the 'electronic element' which has been placed 'directly' between the 'first and second plastic core sheets' so that even the sides of the 'electronic element' are surrounded by the 'first and second plastic core sheets.' That is, if the 'electronic element' is not placed directly between the 'first and second plastic core sheets' or has been already encapsulated by other material, the 'first and second plastic core sheets' cannot encapsulate the 'electronic element.'

(Def. Br. at 31.)

Defendant again uses far too many words to define a simple phenomenon. Webster's non-technical definition of "encapsulate" is "to enclose in or as if in a capsule." (Def. Br. at 31.) "Capsule" is defined as "a compact often sealed and detachable container or compartment." (*Id.*) Thus, according to Defendant, when an element is encapsulated by something, that something fully encloses the element, as though it were contained within a sealed compartment. Defendant notes that in the '207 specification, for example, the electronic element is "fully" sealed in by the plastic core sheets after lamination, and that nothing "intervenes between the core sheets and the electronic element." (Def. Br. at 32-33.) Leighton apparently amended "encapsulated *in* said core" to "encapsulated *by* said core" during the prosecution of the '207 patent, a revision the Defendant views as highly significant. (Def. Br. at 33, citing Office Action Response, p. 75 (emphasis added).) According to Defendant, "encapsulated in" would allow an intervening material, such as "air." By contrast, according to Defendant, "encapsulated by" precludes air and requires that the plastic core sheets completely surround and make contact with the electronic element. (*Id.*)

All this is interesting, but when parsed (as we did at the *Markman* hearing), it is apparent that Defendant is again trying to read the specifications out of the definition and to render the patent meaningless. The patent discloses a process in which the first step is to place an electronic element between two sheets of plastic, thus making what the Court called "a sandwich." In this sandwich, the element touches both sheets of plastic and is not "fully shielded from them. However, for the plastic to touch every square millimeter of the electronic element at the moment the sandwich is made (which is while the plastic is still a solid, before it has been heated and liquefied), the element would have to be completely planar. The electronic elements shown in the disclosed embodiments-such as microchips, wire coil antennas, circuit boards, transponders-are not completely planar. They are three dimensional objects, and they can have irregular surfaces. This means that, when the "sandwich" is made by placing the element between the two sheets of plastic, it is possible that not every square millimeter of the element will be touching the plastic. But these infinitesimal pockets of air do not take the "sandwich" out of the ambit of the claims in suit, because they do not "protect" the element from the plastic (so that when the plastic melts it will touch every square millimeter of the element) and so do not cross the great divide between this family of patents and the prior art '034 patent, which placed the element in a little container before melting the plastic sheets.

6. "Coating At Least One of Said Outer Surfaces of Said Core With a Layer of Ink"

[10] "Coating at least one of said outer surfaces of said core with a layer of ink" means, "Covering at least one of said outer surfaces of said core with a finishing layer of ink."

The only term in this phrase requiring construction is the word "coating."

Plaintiff's proposed definition is that "coating" means "covering." (Pl. Br. at 24.) Plaintiff cites Webster's, p. 219, for the ordinary meaning of "coating" as "2: to cover or spread with a finishing, protecting, or enclosing layer," and notes that the claims in the Patents specify that the layer is ink. (Pl. Br. at 24.)

Claim one of the '207 patent recites the coating step

as follows:

(b) positioning said at least one electronic element ... directly between said first and second plastic core sheets to form a core, said plastic core sheets defining a pair of inner and outer surfaces of said core, (c) positioning said core in a laminator apparatus, and subjecting said core to a heat and pressure cycle..., (d) coating at least one of said outer surfaces of said core with a layer of ink, and (e) applying a layer of overlaminate film to at least one of said outer surfaces of said core.

'207 patent, col. 6:22-38. The specification further provides, "... the use of matte finished laminator plates provides surfaces with a slightly roughened or textured quality which will facilitate the application of a coating thereto..." '207 patent, col. 4:54-58. The Summary of the Invention in the '207 patent describes that "at least one of the upper and lower surfaces of the core comprise[s] a coating printed or otherwise applied thereon," '207 patent, col. 2:20-24, and further explains that the "core is coated on at least one of it's [sic] upper and lower surfaces with a layer of printing ink. This may be accomplished by a wide variety of printing techniques." '207 patent, col. 5:6-12.

The '099 patent contains similar language, using "coating" and "covering" interchangeably-"the sheet of plastic card stock ... comprises at least core with at least one surface thereof covered by a layer of ink;" '099 patent, col. 7:45-51 (numerical references omitted). The prosecution histories of the '207 patent and the '099 patent clarify that "coating" is used to mean more than merely "printing on."

It is important to note that the word "core" is used in all of the patents to describe what I have termed the "sandwich"-the electronic element and the two plastic sheets that directly touch it. Nothing more is included in the definition of the word "core." FN9

FN9. Note that the "book," referred to earlier, is comprised of the "core" *plus* laminating pads and steel plates that facilitate the lamination process but are not a part of the finished product. *See, e.g.*, '207 patent, col. 4:35-40.

Defendant proposes that "coating... with a layer of ink" means that "the ink layer must directly contact at least one of the 'outer surfaces' of the 'core.' " (Def. Br. at 34.) Defendant cites to the claim and specification language cited above in support of its definition. Defendant also notes that the '207 specification states that, "This printing step is performed to coat at least one surface of core with a layer of aesthetically pleasing ink." (Def. Br. at 35, quoting '207 patent, col. 5:6-17, (numeric references omitted).) Finally, Defendant notes that Leighton "did not disclose applying another layer with ink imprinted on it to an outer surface of the core itself," and then quotes the '207 patent, "This layer of ink cosmetically hides the one or more electronic elements that are embedded within core, and prevents these one or more electronic elements from showing through the relatively thin core." (Def. Br. at 35, quoting the '207 patent, col. 5:17-21 (numerical references omitted).) In sum, Defendant argues that the intrinsic evidence leads to the conclusion that "coating ... with a layer of ink" means the ink is applied to at least one of the "outer surfaces" of the "core," so the layer of ink "directly contacts that outer core surface." (Def. Br. at 25.)

As is clear from the above language, Defendant is trying to preclude Plaintiff from claiming that the patent covers a process wherein something is applied directly to the surface of the core before the surface is covered with ink. The analogy used by the parties at the *Markman* hearing was as follows: Assume we are interpreting the sentence, "The table is covered with ink." Obviously, if a layer of ink is applied directly to the top surface of the table, the table is covered with ink. The question posed by the parties was whether, if a tablecloth were placed over the top surface of the table and the cloth were then covered with ink, the table would be covered with ink.

The answer is no. The table would then be covered with an ink-stained tablecloth. The ink would cover the cloth, and the cloth would cover the table. But the ink would not coat the table-it would coat the cloth. This notion of immediacy (or what Defendant calls direct contact) is implicit in the dictionary definition of "coat," which is "to cover or spread with a finish-

ing, protecting or enclosing layer." Ink applied otherwise than to the surface of the core itself would not "finish" or "enclose" the core.

7. "Minimal ... Ram Pressure"

[11] The word "minimal" in the phrase "minimal first ram pressure" means, "The smallest or least amount [of ram pressure] necessary to accomplish the designated step."

At the outset, I note that I am focusing here solely on the words "minimal... ram pressure" rather than on the entire phrase "minimal first ram pressure." This is because the parties greatly dispute what "first" means as used in this phrase, and this is not the place to discuss that issue. This phrase appears in claim 16 of the '207 patent, and claim 15 of the '155 patent:
positioning said core in a laminator apparatus, and subjecting said core to a heat and pressure cycle ... comprising the steps of: (i) heating said core in said *361 laminator, in the presence of a minimal first ram pressure.

'207, col. 6:19-23; '155 patent, col. 5:15-19.

The specifications for the '207 patent indicate that "minimal" means "little or no." Col. 4:41-44.

Defendant proposes that this phrase means "applying little or no pressure to the 'core,' but in no event a ram pressure more than about 10 pounds per square inch."

According to Defendant, "minimal" is not a technical term, and it is defined in Webster's to mean "relating to or being a minimum: constituting the least possible size, number or degree." (Def. Br. at 36.) "Minimum" is defined in Webster's to mean, "the least quantity assignable, admissible, or possible." (Id.) To this extent, Defendant is precisely correct.

But Obertur goes on to argue Leighton has capped the minimal first ram pressure at 10 pounds per square inch for all applications. (Def. Br. at 37.) It derives this number from language in the specifications for the '099 and '367 patents (whose claims, interestingly, do not use the phrase "minimal...ram pressure"). The '099 patent (col. 5:56-61) says this about the amount of pressure required for a particular step:
One book is positioned in laminator ... the first lamination cycle is initiated by closing laminator platens preferably applying little or no ram pressure to book. This is preferably done using hydraulic pressure, and a pressure not to exceed about 10 pounds per square inch is believed sufficient for most applications.

'099 patent, col. 5:56-61 (numerical references omitted.)

I reject Defendant's proposed definition. The word "minimal" does not connote any sort of numeric cap. And to the extent the references in the '099 and '367 specifications to 10 p.s.i. are relevant at all, I am constrained to note that the patentee expressly states that he "believes" this amount of pressure will be "sufficient for most applications"-indicating that it is entirely possible that slightly more pressure (how much is not specified) may be needed for some applications.

But nothing in Webster's or the patent specifications remotely suggests that 10 p.s.i. of ram pressure will qualify as "the least possible size" in every possible case. Therefore, I reject Defendant's argument.

8. "First Pressure," "First Ram Pressure," "Second Pressure" and "Third Pressure"

[12] Claim 1(c) of the '207 patent recites these terms in the following manner:
(i) heating said core for a first period of time; (ii) applying a first pressure to said core for a second period of time such that said at least one electronic element is encapsulated by said core; (iii) cooling said core while applying a second pressure to said core.

'207 patent, col. 6:32-36.

Claim 16(c) recites:
(i) heating said core in said laminator, in the presence of a minimal first ram pressure, to a temperature which causes controlled flow of said plastic which makes up said first and second plastic core sheets; (ii) applying a second pressure uniformly across said core for encapsulating said at least one electronic element within said controlled flow plastic; (iii) sub-

sequently cooling said core in conjunction with the concurrent application of a third pressure uniformly across said core.

'207 patent, col. 9:22-32.

The issue here is whether the terms "first," "second" and "third," as used in this and other claims, refer to the sequential order in which the steps are to be performed-so that, in claim 1, step (c)(ii) '383 must be performed before step (c)(iii), and in claim 16, step (c)(i) must be performed before step (c)(ii), which must be performed before step (c)(iii)-or whether these words are used simply to differentiate between like elements (three different applications of pressure), without intending any sequential limitation, so that the steps can be performed in any sequential order.

It is of course well settled that "comprising" language renders a claim open-ended. *Invitrogen Corp. v. Biocrest Mfg.*, 327 F.3d 1364, 1368 (Fed.Cir.2003). And in many patents, the words "first pressure," "second pressure," and "third pressure" would indicate nothing more than that these are several different levels of pressure, which readers of the patent would have to distinguish among as they parsed the patent.

[13] It is also true, however, that the terms "first," "second" and "third" can be read to denote the order of steps. *See Applera Corp. v. Micromass UK Ltd.*, 186 F.Supp.2d 487, 505 (D.Del.2002), *aff'd without published opinion*, 60 Fed.Appx. 809 (Fed.Cir.2003). While the terms "first," "second," and "third" are commonly used to identify separate claim elements, nothing precludes finding that the terms also specify temporal or positional relationships. *Id.* Where the language of the claim, the specification and the prosecution history logically indicate a sequential process, recited steps in a claim must be read to require a sequential order. *See, e.g., Loral Fairchild Corp. v. Sony Corp.*, 181 F.3d 1313, 1322 (Fed.Cir.1999); *Mantech Envtl. Corp. v. Hudson Envtl. Services Inc.*, 152 F.3d 1368, 1376 (Fed.Cir.1998).

The context of these terms in the patents in suit makes it abundantly clear that the terms are used to denote the relative order of the steps-that is, their order vis-à-vis each other. Indeed, counsel for Plaintiff admitted as much at the *Markman* hearing. For example, in claim 1, step (c) of the '207 patent, the pressure that is applied during cooling must follow the pressure that is applied to "encapsulate" the element in plastic. In claim 16 of the same patent, the "minimal sum pressure" that is applied during the process of heating the core and melting the plastic necessarily precedes the application of the "second pressure" which encapsulates the element in liquefied or partially liquefied plastic, which in turn necessarily precedes application of the "third pressure" as the hot, molten plastic cools. [FN10] Thus, the words "first," "second" and "third" both distinguish among three distinct steps in the claimed process and denote the order in which the three steps outlined in the claims are to be performed relative to one another.

FN10. Plaintiff conceded in its *Markman* presentation that in claim 16, step c(iii) must follow step c(ii), pointing to the use of the word "subsequently" in step c(iii).

However, Defendant would have me go further. Oberthur argues that these terms should be construed so that "first pressure" and "first sum pressure" would be limited to "the very first pressure applied during the heat and pressure cycle." The term "second pressure" would be limited to "the next pressure applied after the first pressure during the heat and pressure cycle." And the term "third pressure" would be limited to "the next pressure applied after the second pressure during the heat and pressure cycle." (Def. Br. at 37.) Defendant's proposed construction precludes the application of any pressure prior to the application of whatever pressure is designated as "first" and the insertion of any pressure between the step involving the "first pressure" and the step involving the "second pressure." In '383 other words, Defendant argues that the words "first," "second," and "third" indicate not only the relative order of the claimed steps vis-à-vis each other, but also the absolute order in which they must be performed.

Defendant has not presented any convincing reason why the words "first," "second" and "third" as used in the cited claims mean concrete absolute order as opposed to relative order. Defendant's counter-ar-

guments based on the purported "main objective" of the patent is not persuasive; neither does the patentee's use of the phrase "highly coordinated" process indicate that "first," "second" and "third" mean "very first" and "next one after the very first," etc.

Moreover, language taken from a dependent claim strongly suggests that the words ought not to bear the limiting meaning assigned to them by Defendant. Dependent claim 18 of the '367 patent recites, "The process according to [independent] claim 1 wherein the pressure on said core in step (c)(i) is less than 10 p.s.i." Step (c)(i) in claim 1 recited heating the core for "a first period of time." It is not until step (c)(ii) of claim 1 that "a first pressure" is applied. Indeed, in the '207 provisional application, claim 1 expressly indicated that no pressure was to be applied to the core at the beginning of the first heat cycle. (That restriction was removed from the final '207 application.) Thus, dependent claim 18 of the '367 patent narrows claim 1 by reciting an application of very light pressure (less than 10 p.s.i.) prior to the application of "a first pressure."

But Defendant argues that claim 18 does not help Leighton because the claim itself is indefinite under the "Lack of Antecedent Basis" doctrine as set forth in the Manual of Patent Examining Procedure (MPEP) § 2173.05(e).

Dependent claim 18 recites "the pressure" to be applied during a certain step (step (c)(i)) as disclosed in claim 1. Step (c)(i) in claim 1 does not mention any application of pressure. Therefore, according to Defendant, "*the* pressure on said core in step (c)(i)" (emphasis added), as recited in claim 18, has no antecedent, and Leighton is trying to read something into that claim that is not there.

Plaintiff responds that claim 1 and claim 18 of the 367 patent disclose two different embodiments of a single invention, and that as long as the two or three pressures disclosed in the patent claims are part of an enclosure/lamination process, that process is covered by the patent.

On reflection, I reject defendant's argument as too narrow a reading of the "lack of antecedent basis" doctrine.

Section 2173.05(e) of the MPEP reads, in pertinent part,

A claim is indefinite when it contains words or phrases whose meaning is unclear. The lack of clarity could arise where a claim refers to "said lever" or "the lever," where the claim contains no earlier recitation or limitation of a lever and where it would be unclear as to what element the limitation was making reference...

However, the Manual goes on to read:

Obviously, however, the failure to provide explicit antecedent basis for terms does not always render a claim indefinite. If the scope of a claim would be reasonably ascertainable by those skilled in the art, then the claim is not indefinite... The totality of all the limitations of a claim and their interaction with each other must be considered to ascertain the invention's contribution to the art.

Considering the "totality of all the limitations" of claims 1 and 18 of the '367 patent, Defendant's interpretation cannot be correct. Step (c)(ii) of claim 1 recites, "384 "applying *a* first pressure to said core." As noted above, "a first pressure" does not necessarily mean that no pressure was applied during a prior step. While step (c)(i) does not specifically state that pressure must be applied, it does not preclude the application of pressure, either. Dependent claim 18 is most reasonably interpreted to limit claim 1 to the situation where pressure on the core in step (c)(i), *if any*, is less than 10 p.s.i. And I note that "less than 10 p.s.i." of pressure encompasses no pressure whatsoever.

[14] Courts interpreting patents routinely avoid indefiniteness by interpreting language to provide for an antecedent basis. *See, e.g., Astra Aktiebolag v. Andrx Pharmaceuticals, Inc.*, 222 F.Supp.2d 423, 438 (S.D.N.Y.2002) (interpreting an antecedent phrase, "alkaline reacting compound," to include by definition the phrase in question, "micro-environment," in order to (i) find antecedent basis for "the micro-environment" and (ii) avoid indefiniteness for lack of antecedent basis) (emphasis added). Most particularly, in *Digital Biometrics, Inc. v. Identix, Inc.*, 149

F.3d 1335, 1344 (Fed.Cir.1998), the Federal Circuit noted that if a claim is "susceptible to a broader and narrower meaning, and the narrower one is clearly supported by the intrinsic evidence while the broader one raises questions of enablement under [the MPEP], [the court must] adopt the narrower of the two." *See also Rhine v. Casio, Inc.*, 183 F.3d 1342, 1345 (Fed.Cir.1999) (if a claim is susceptible to two interpretations, one of which renders it valid and the other of which renders it invalid, the claim must be construed to sustain its validity).

Outside the patent context, there are cases concluding that use of the definite article "the" particularizes the subject and narrows the possible class of possible antecedents. For example, in *Freytag v. Commissioner of Internal Revenue*, 501 U.S. 868, 902, 111 S.Ct. 2631, 115 L.Ed.2d 764 (1991), Justice Scalia, in a concurring opinion that did not command a majority on the Supreme Court, concluded that use of the definite article "the" in the phrase "the Courts of Law" (which appears in the Appointments Clause of the Constitution, Art. II, § 2, cl. 2) narrowed a class to specific "envisioned" members. Similarly, while engaging in statutory construction in the context of a patent case, the Federal Circuit concluded that Congress's decision to say "the use" rather than "a use" meant "a specific" use rather than a "previously undefined" use. *Warner-Lambert Co. v. Apotex Corp.*, 316 F.3d 1348, 1356 (Fed.Cir.2003)(citing *Freytag*, 501 U.S. at 902, 111 S.Ct. 2631). Finally, in *American Bar Association v. Weiss*, 231 F.3d 1, 4-5 (D.C.Cir.2000), the D.C. Circuit called the notion that the article "the" particularizes its subject "a rule of law."

But none of these pronouncements involved patent claim construction, which has its own specialized rules, the first of which is that, wherever possible, a claim is to be construed to make sense of the claim. No case has been cited to the Court, and I have found none, that applies Justice Scalia's *Freytag* analysis to render a patent claim indefinite. I conclude that the cases cited in the preceding paragraph are inapposite here.[FN11]

FN11. I am bolstered in this conclusion by the fact that Oberthur did not cite these cases in its brief. My law clerk found them while we were exploring Oberthur's argument.

Therefore, considering the "totality of the limitations," I find claim 18 has antecedent basis in claim 1, step (c) as a whole, and is not indefinite.

9. "Controlled Flow"

[11] The term "controlled flow" is construed to mean, "Regulated and directed forward continuous movement."

*385 The phrase appears in claim 16 of the '207 patent:
(i) heating said core in said laminator, in the presence of minimum first nip pressure, to a temperature which causes controlled flow of said plastic which makes up said first and second plastic core sheets; (ii) applying a second pressure uniformly across said core for encapsulating said at least one electronic element within said controlled flow.

'207 patent, col. 8:22-28. The specification states that "A heat cycle is applied to the core sheets in the laminator thus liquefying or partially liquefying the sheets." '207 patent, col. 2:34-36. The specification further describes that the purpose of the "controlled flow" is to enclose the electronic element, "Once the heat cycle has been applied to the book as is set forth above, the nip pressure of laminator is increased to facilitate the flow of the plastic core sheets so that the one or more electronic elements are encapsulated thereby..." '207 patent, col. 4:48-52.

The meaning of the phrase "controlled flow" would appear to be self-evident. When a liquid "flows" it moves forward continuously. "Controlled" indicates some degree of restraint (Plaintiff's proposed term) or regulation or direction (my preferred term).

Defendant claims the phrase means that " 'the first and second plastic core sheets' at least partially liquify so as to fully enclose the 'electronic element' at the nip pressure and heat applied to the 'core sheets' and allow the outer surfaces of the finished card before dye sublimation printing to assume a smoothness of approximately .0005 inches or better." (Def. Br. at 41.)

According to Defendant, "flow" is a technical term. (Id.) McGraw Hill defines "flow" to mean "the forward continuous movement of fluid, such as gases, vapors, or liquids, through closed or open channels or conduits." Defendant cites the language of the specifications quoted above as supporting the premise that the electronic element is fully encapsulated by the first and second plastic core sheets, which at least partially liquefy in order to "flow" and surround the electronic element. (Def. Br. at 42.) Defendant also notes that Leighton stresses in the '207 specification that his invention lies in producing a contactless card with a sufficiently smooth and regular surface to receive dye sublimation printing, and that this smoothness cannot be achieved unless the core plastic sheets at least partially liquefy and flow. (Id.)

I agree with Defendant to the extent that plastic, in the state we normally encounter it, would not "flow." And we know from the specifications and claims discussed above that the lamination process at issue here involves heating the plastic core sheets. So I do agree that the plastic core sheets only "flow" because they have been heated, intentionally, during lamination. However, Defendant's proposed definition of "controlled flow" attempts to introduce into the definition of that phrase concepts that are not even found in the claims-a transparent effort to limit the meaning of this phrase to one disclosed embodiment. That is not the proper function of claim construction.

10. "Cooling Said Core While Applying a Second Pressure"

[15] The phrase "cooling said core while applying a second pressure" is construed to mean, "Cooling said core during the time that a second pressure is applied."

The phrase appears in claim 1 of the '207 patent: (i) heating said core for a first period of time; (ii) applying a first pressure to said core for a second period of time such that said at least one electronic element is encapsulated by said core; *356 (iii) cooling said core while applying a second pressure to said core.

'207 patent, col. 6:31-36.

The only dispute between the parties is the meaning of the word "while." Plaintiff asserts that "while" means "during the time that." Defendant argues that the phrase means "that cooling starts later than, or at the same time as, applying a second pressure." (Def. Br. at 43.) In other words, Defendant asks me to conclude that the word "while" fairly implies the moment at which the process of providing the pressure starts-and, in particular, to exclude from the ambit of the claims any process that involves the application of the "second pressure" before the core cooling begins, even if the cooling and the second pressure proceed simultaneously for some period of time.

Defendant's attempt to limit the claim in this way is unavailing. Webster's defines "while" to mean "during the time that"-in other words, simultaneously or concurrently. Defendant's suggestion that this word says or implies anything about the relationship between the time the cooling begins and the time the application of pressure begin makes no sense. The claim language neither says nor implies anything about whether (1) cooling starts before pressure, (2) pressure starts before cooling, or (3) they start at the same time. The claim language requires only that the cooling and second pressure be happening simultaneously, regardless of the start sequence of the cooling and the application of pressure.

At the Markman hearing, the parties illustrated this term with the example of taking a nap "while my roommate goes shopping." The illustration works well. Clearly, as long as roommate # 1 is napping at any point in time during roommate # 2's trip to the store-regardless of when the nap commenced-roommate # 1 would have been napping "while" roommate # 2 went shopping.

11. "Cooling Said Core in Conjunction With the Concurrent Application of a Third Pressure"

[12] Claim 16 of the '207 patent states, "(iii) subsequently cooling said core in conjunction with the concurrent application of a third pressure uniformly across said core, said core including and [sic] upper and lower surfaces." '207 patent, col. 8:29-32.

The phrase is construed to mean, "Cooling said core while at the same time applying a third pressure."

As above, Defendant urges that the phrase "in conjunction with" fairly implies that the cooling "starts and ends at the same time a third pressure is applied." (Def. Br. at 44.) For the reasons recited above, I reject the Defendant's argument that these words suggest absolute synchronicity (though I question why the patentee could not have used the same terminology in both claims).

12. "Plastic Core Sheets"

[18] The phrase "plastic core sheets" is construed to mean, "Sheets of plastic between which the electronic element is positioned."

The phrase appears in claim 1 of the '207 patent, for example:
A process for incorporating at least one electronic element in the manufacture of a plastic card, comprising the steps of: (a) providing first and second plastic core sheets; (b) positioning said at least one electronic element in the absence of a non-electronic carrier directly between said first and second plastic core sheets to form a core, said plastic core sheets defining a pair of inner and outer surfaces of said core; (c) positioning said core in a laminator apparatus, and subjecting*367 said core to a heat and pressure cycle.

'207 patent, col. 6:18-29. See also '099 patent, col. 5:13-17.

Defendant does not address this term.

Plaintiff asks me to construe the phrase, but urges that the meaning of the phrase is clear from the wording of the subject claims. (Pl. Br. at 17.) I agree.

13. "Laminator Apparatus"

[19] The phrase "laminator apparatus" is construed to mean, "Equipment that is used to unite two or more layers of material, such as the core, by the application of heat and pressure."

The specification of the '207 patent notes that the laminator apparatus is used for "the manufacture of plastic cards including at least one electronic element therein," '207 patent, col. 2:16-20, and that it is used to unite the plastic core sheets and the electronic element, col. 4:22-5:5.

Plaintiff proposes that the specifications and the prosecution histories of the Patents indicate that a "laminator apparatus" is "equipment that is used to unite two or more layers of material, such as the core, by the application of heat and pressure." (Pl. Br. at 23-24.) Defendant does not object, so I adopt Plaintiff's definition. (Pl. Br. at 23-24.)

14. "Milling"

[20] "Milling" is construed to mean, "using a machine to remove."

Claim 1 of the '099 patent recites a step of "milling a region of said core to a controlled depth so as to form a cavity which exposes at least one contact pad of said electronic element." '099 patent, col. 9:3-5. Claims 1 and 22 of the '367 patent recite virtually identical steps.

Plaintiff proposes that the ordinary meaning of the word milling, from the Dictionary of Composite Materials, p. 91, is "[a] machining process for removal of material." (Pl. Br. at 25.) The specifications are consistent with this construction, stating that each card undergoes a controlled-depth milling operation to form a window or cavity. '099 patent, col. 8:1-6. Defendant does not object, so I adopt Plaintiff's definition.

Conclusion

For the foregoing reasons, the disputed terms are construed in the manner noted above.

This constitutes the decision and order of the court.

S.D.N.Y.,2005.
Leighton Technologies LLC v. Oberthur Card Systems, S.A.
358 F.Supp.2d 361

Briefs and Other Related Documents (Back to top)

- 2006 WL 2582010 (Trial Pleading) Amended Answer to Counterclaims, Affirmative Defenses (Aug. 11, 2006) Original Image of this Document (PDF)
- 2006 WL 2582009 (Trial Pleading) Answer to

Third Amended Complaint, Affirmative Defenses and Counterclaims (Aug. 9, 2006) Original Image of this Document (PDF)
• 2006 WL 2426501 (Trial Pleading) Third Amended Complaint (Jul. 27, 2006) Original Image of this Document (PDF)
• 2006 WL 1416599 (Trial Motion, Memorandum and Affidavit) Plaintiff Leighton Technologies' Memorandum in Opposition to Defendant's Request to Set Aside Magistrate Smith's March 27, 2006 Order (Apr. 20, 2006) Original Image of this Document with Appendix (PDF)
• 2006 WL 1416588 (Trial Motion, Memorandum and Affidavit) Oberthur Card Systems, S.A. Memorandum in Support of Objections to the Magistrate Judge's Order Pursuant to Fed. R. Civ. P. 72(a) (Apr. 7, 2006) Original Image of this Document (PDF)
• 2006 WL 551391 (Trial Motion, Memorandum and Affidavit) Oberthur Card Systems, S.A.'s Reply Memorandum in Support of Motion for Summary Judgment of Patent Invalidity (Jan. 5, 2006) Original Image of this Document (PDF)
• 2005 WL 3647762 (Trial Pleading) Answer to Second Amended Complaint, Affirmative Defenses and Counterclaims (Nov. 10, 2005)
• 2005 WL 3280982 (Trial Pleading) Second Amended Complaint (Oct. 25, 2005)
• 2005 WL 3284599 (Trial Motion, Memorandum and Affidavit) Memorandum in Support of Motion for Summary Judgment of Patent Invalidity (Oct. 18, 2005) Original Image of this Document (PDF)
• 2005 WL 3280977 (Trial Pleading) First Amended Complaint (Oct. 5, 2005) Original Image of this Document (PDF)
• 2004 WL 3567793 (Trial Motion, Memorandum and Affidavit) Oberthur Card Systems, S.A. Markman Reply Brief (Nov. 29, 2004) Original Image of this Document (PDF)
• 2004 WL 3567788 (Trial Motion, Memorandum and Affidavit) Plaintiff's Brief in Support of its Claim Construction (Nov. 5, 2004) Original Image of this Document (PDF)
• 2004 WL 3567790 (Trial Motion, Memorandum and Affidavit) Plaintiff's Brief in Support of its Claim Construction (Nov. 5, 2004) Original Image of this Document with Appendix (PDF)
• 2004 WL 3567787 (Trial Pleading) Answer and Counterclaims (Jul. 9, 2004)
• 2004 WL 3556772 (Trial Pleading) Complaint (May 30, 2004) Original Image of this Document (PDF)
• 7:04cv02496 (Docket) (Mar. 30, 2004)
• 2004 WL 3567789 (Trial Motion, Memorandum and Affidavit) Oberthur Card Systems, S.A Markman Brief (2004)
• 2004 WL 3567791 (Trial Motion, Memorandum and Affidavit) Plaintiff's Brief in Support of its Claim Construction (2004)
• 2004 WL 3567792 (Trial Motion, Memorandum and Affidavit) Plaintiff's Brief in Opposition to Defendant's Markman Brief (2004) Original Image of this Document with Appendix (PDF)
• 2004 WL 3814972 (Trial Motion, Memorandum and Affidavit) Oberthur Card Systems, S.A.'s Reply Memorandum in Support of Motion for Summary Judgment of Objections to the Magistrate Judge's Order Pursuant to Fed. R. Civ. P. 72(a) (2004) Original Image of this Document (PDF)

END OF DOCUMENT

EXHIBIT 5

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

LEIGHTON TECHNOLOGIES, LLC,

Plaintiff-Counterclaim Defendant,

v. 04 Civ. 2496(CM)

MARKMAN HEARING

OBERTHUR CARD SYSTEMS, S.A.,

Defendant-Counterclaim Plaintiff.

White Plains, N.Y.
February 9, 2005
10:00 a.m.

Before:

THE HONORABLE COLLEEN McMAHON,

District Judge

APPEARANCES

SUTHERLAND, ASBILL & BRENNAN, LLP
Attorneys for Plaintiff-Counterclaim Defendant
ROBERT A. GUTKIN
BLAIR M. JACOBS
NEIL G. COHEN
CHRISTINE ONDRICK

BAKER & McKENZIE
Attorneys for Defendant-Counterclaim Plaintiff
JAMES DAVID JACOBS
FRANK M. GASPARO

Also present: MIREILLE CLAPIER, Oberthur inhouse counsel

all the patents, appears in all the claims. In a representative claim of the '207 claim up there, electronic element is claimed as being between said first and second plastic core sheets.

THE COURT: Let me see if I can — we've read all of this, so I can actually focus on some questions.

Your client claims a process, a process for enclosing something in which you do not claim any kind of patent rights at all, via the electronic element, in plastic to get it onto a card, right? You're claiming the process. You're not claiming the thing.

MR. GUTKIN: I believe that that's a correct statement.

THE COURT: You're not claiming any rights in the electronic element itself.

MR. GUTKIN: No, no.

THE COURT: You're just claiming the process for enclosing the electronic element, or encapsulating, or whatever the word is that gets used, the electronic element and embedding it in the card.

MR. GUTKIN: That's one of the claims, that's correct. And in the latter two patents, there's also claims with milling the card.

THE COURT: But it's the process, basically, of getting the element incorporated into the card.

EXHIBIT 6

US005880934A

United States Patent [19]

Haghiri-Tehrani

[11] Patent Number: 5,880,934

[45] Date of Patent: Mar. 9, 1999

[54] **DATA CARRIER HAVING SEPARATELY PROVIDED INTEGRATED CIRCUIT AND INDUCTION COIL**

[75] Inventor: Tahya Haghiri-Tehrani, Munich, Germany

[73] Assignee: Giesecke & Devrient GmbH, Munich, Germany

[21] Appl. No.: 968,588

[22] Filed: Oct. 29, 1997

Related U.S. Application Data

[63] Continuation of Ser. No. 437,388, May 11, 1995, abandoned.

[30] **Foreign Application Priority Data**

May 31, 1994 [DE] Germany 44 19 497.4

[51] Int. Cl.* H05K 1/11; H05K 1/14

[52] U.S. Cl. 361/737; 235/492; 257/679; 361/689; 361/820

[58] Field of Search 235/487, 488, 235/492, 449, 451, 441, 491; 257/678, 679; 361/737, 761, 782, 813, 811, 831, 764, 807, 809, 820; 340/825.44; 455/269; 251/267, 252, 300, 297

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,795,898	1/1989	Bernstein et al.	235/487
4,868,373	9/1989	Ophej et al.	235/492
4,909,742	3/1992	Stumpfl .	
5,321,240	6/1994	Takahira	235/492
5,361,061	11/1994	Mays et al.	455/269
5,390,847	3/1995	Dent	235/488
5,428,214	6/1995	Hatchoe et al.	235/492
5,514,860	5/1996	Haghiri-Tehrani	257/678
5,519,201	5/1996	Templeton, Jr. et al.	235/492
5,544,014	8/1996	Atsumi	361/737
5,598,032	1/1997	Fidalgo	257/679
5,606,488	2/1997	Ozawa	361/737
5,690,773	11/1997	Fidalgo et al.	257/679

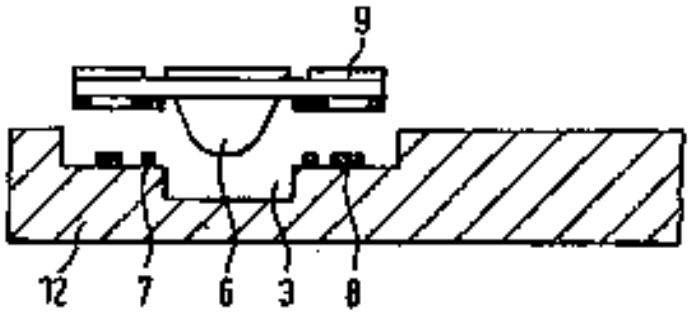
Primary Examiner—Donald Sparks

Attorney, Agent, or Firm—Stevens, Davis, Miller & Mosher, L.L.P.

[57] **ABSTRACT**

The invention relates to a data carrier comprising a card body and an integrated circuit connected electroconductively via contact elements with at least one coil serving the purpose of power supply and/or data exchange of the integrated circuit with external devices. The invention is characterized in that the integrated circuit and the contact elements form a separate module known in the art and the coil is disposed on a card body constructed from one or more layers as known fashion. The coil is preferably formed as a flat coil.

13 Claims, 3 Drawing Sheets



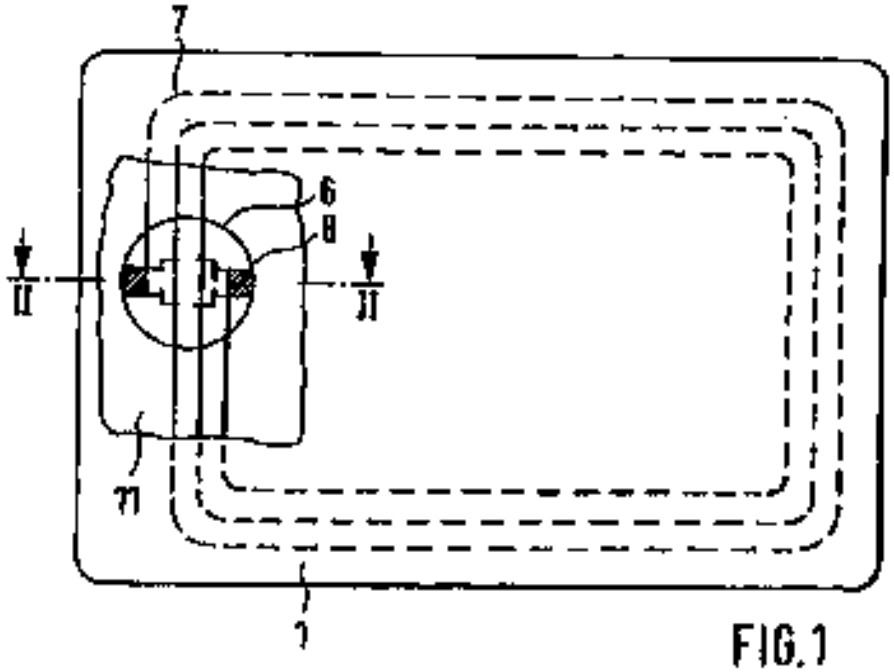


FIG. 1

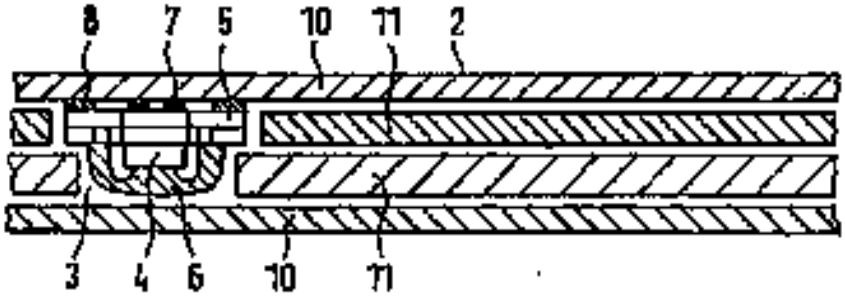


FIG. 2

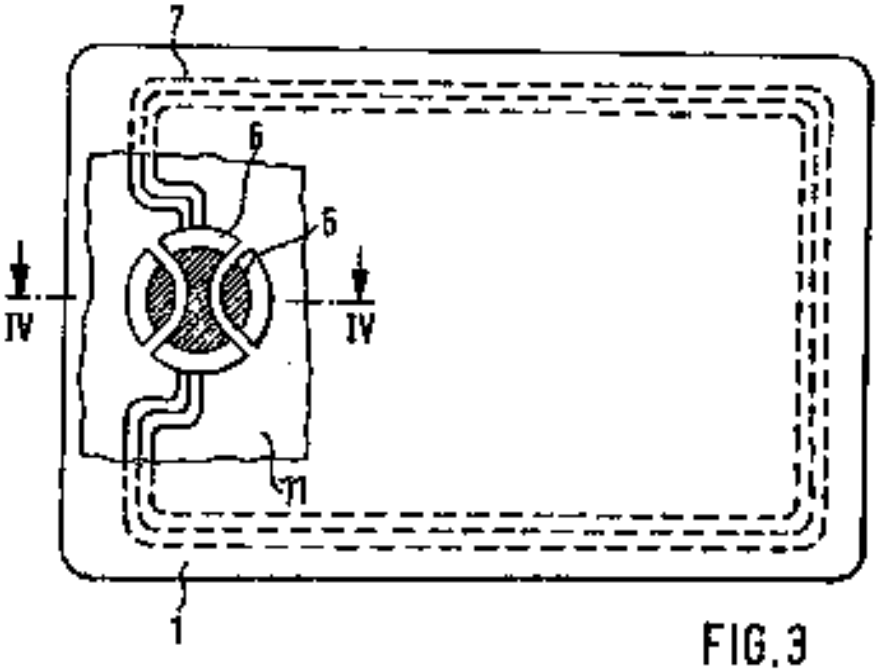


FIG. 3

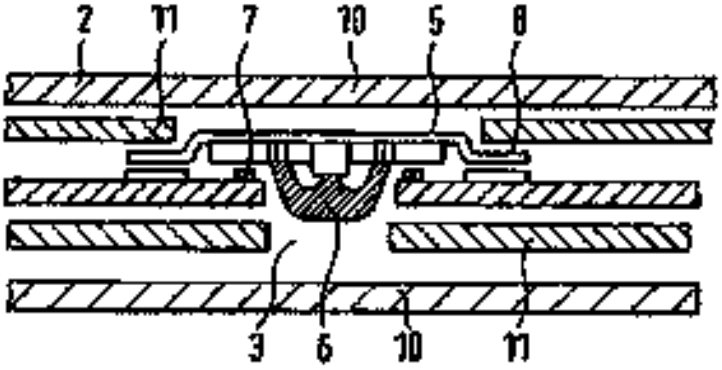


FIG. 4

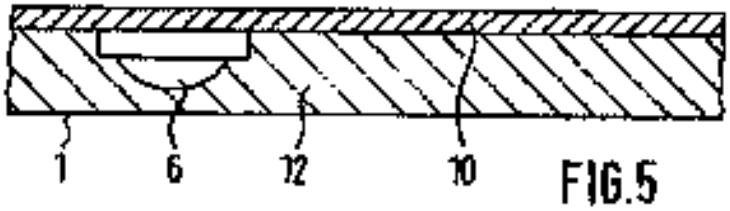


FIG.5

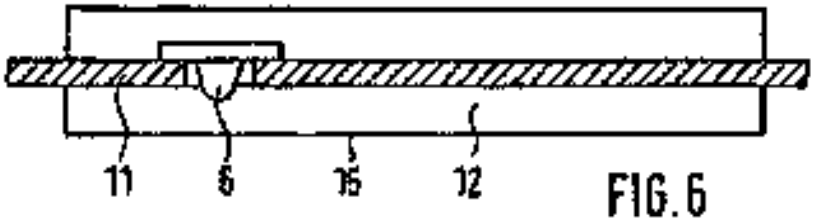


FIG.6

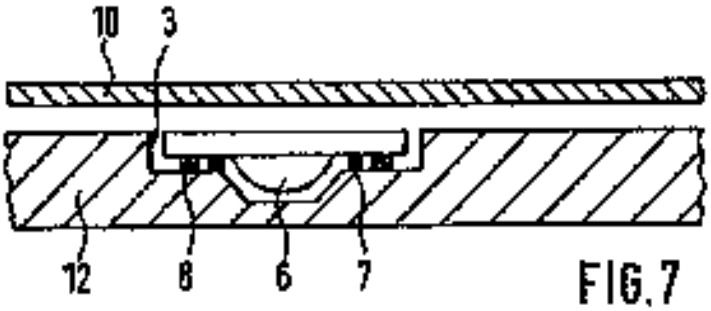


FIG.7

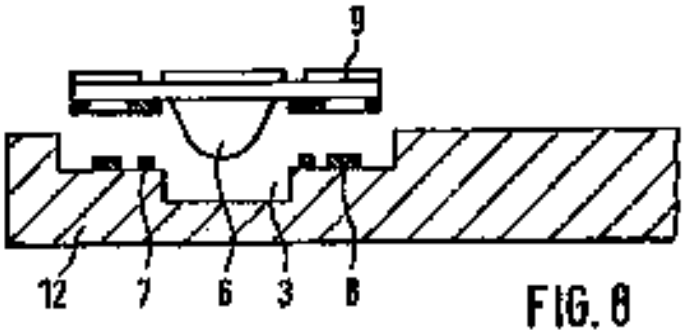


FIG.8

DATA CARRIER HAVING SEPARATELY PROVIDED INTEGRATED CIRCUIT AND INDUCTION COIL

This application is a continuation of application Ser. No. 08/437,388, filed on May 11, 1995, (abandoned).

This invention relates to a data carrier according to the preamble of claim 1. The invention also relates to a method for producing a data carrier.

Data carriers with integrated circuits are used in the form of credit cards, bank cards, cash payment cards and the like in a great variety of services sectors, for example in cashless money transfer or in the intra-company area as access authorization. With a great number of these data carriers, power is supplied and/or data exchanged with external devices in contacting fashion via the outer contact surfaces of an electronic module. Since the contact surfaces for connecting the data carriers to a reading/writing device are exposed in these prior art data carriers there is a danger of the contact surfaces being soiled, which may lead to poor contacting and thus faulty data transmission between the data carrier and the corresponding reading/writing device of the terminal. Regardless of that, faulty data transmission can also occur due to faulty positioning of the contact surfaces in the reading/writing device of the terminal. To avoid the above-mentioned disadvantages data carriers with contactless, e.g. inductive, coupling are already known from the prior art.

EP-A1 0 376 062 discloses e.g. an electronic module and a method for producing the module. The known module contains an insulating carrier film and a chip with an integrated circuit which has at least two interconnecting leads and is disposed on the carrier film. On the same side of the carrier film of the module there is a coil. The coil, which is part of the module, permits inductive coupling between the module and an external device. The coil is executed as a ring-shaped, wire-wrapped coil surrounding a space which completely houses the chip and the elements electroconductively connecting the leads of the chip with the leads of the coil, and is subsequently filled with an electrically insulating and hardened viscous compound. After its completion the known module is installed in a card, the coil guaranteeing effective protection of the chip and the electroconductive connecting elements against stresses to which this card is exposed during use.

While the arrangement of the coil on the module provides good protection for the chip, this specific structure of a module means that specially constructed modules must be used for producing a data carrier with contactless coupling. This has the disadvantage that a special method is required or specific tools must be provided for producing the modules. Furthermore, owing to the special production of these modules conventional ones, i.e. modules without a coil, cannot be used for producing a data carrier with contactless coupling. Finally, high costs can arise with small runs of data carriers with contactless coupling with a specially produced module, since the latter must be manufactured separately. All this means that these special modules impair the flexibility of producing data carriers with contactless coupling.

The invention is thus based on the problem of proposing a data carrier with contactless coupling which is easier to produce.

This problem is solved by the features stated in the independent claims.

The basic idea of the invention is to decouple module and coil, whereby the module can be produced separately in known fashion and the coil is manufactured independently of the module and applied to a layer of the card body.

The coil can be disposed for example on a cover layer or on an inner layer of a multilayer card body or on an injection molded card body part. The coil can be printed on the card body layer e.g. in wire-wrapped form or else as an electroconductive layer by the screen printing method e.g. by means of an electroconductive adhesive. The coil can alternatively be punched out of a metal foil or etched out of an electroconductively coated plastic film and glued to the card body layer. Further it is also possible for the coil to be stamped in the card body layer in the form of an electroconductive layer by the hot stamping method. The coil is preferably formed as a flat coil, the leads of the coil and the contact elements of the module being standardized with respect to location and position in the card body in relation to each another, for example disposed directly opposite each other, thereby permitting a simple electroconductive connection to be established between the leads of the coil and those of the module. This can be done for example with the help of an electroconductive adhesive or else by means of soldering or other common techniques familiar to the expert. Finally it is noted that the module can also be executed as a hybrid module which additionally has outer contact surfaces for contacting coupling with external devices.

The advantages achieved with the invention consist in particular in that one can use the modules produced in conventional fashion, i.e. modules without coils, thereby giving more flexibility to the production of data carriers with contactless coupling. This necessitates no great change in previous module production, requiring no special new tools or new method for producing the modules. Furthermore, due to the arrangement of the coil on a card body layer the invention also permits high flexibility in designing the coil, for example in terms of the required inductance, e.g. the number of turns, active coil surface, wire diameter, etc., and also high flexibility in selecting the technology for realizing the coil on the card body layer. Furthermore, the invention permits simple connection of the module with the coil, in particular since the coil leads and the contact elements of the module which are electrically connected with the coil leads are standardized in terms of location and position in the card body. Also, the structure of the module can be chosen freely including the location and position of the contact elements; for example the contact elements of the module can be obtained from an electroconductively coated carrier film or punched out of a metal band by the lead frame technique. The integrated circuit can be glued to a central area of the punched lead frame here e.g. with the help of an adhesive. The electroconductive connection of the integrated circuit with the contact elements of the module can be effected e.g. in known fashion by the wire-bonding or the so-called TAB technique. These techniques and the different designs of the modules in this connection are familiar to the expert.

Further properties and advantages of the invention will result from the following description of different embodiment examples, which are explained more closely with reference to the drawings.

Further embodiments and advantages of the invention will result from the subclaims as well as the drawings, in which:

FIG. 1 shows a data carrier in plan view, the module and a part of the coil being shown as a detail without the upper cover layer,

FIG. 2 shows the detail of the data carrier according to FIG. 1 in a sectional view,

FIG. 3 shows the plan view of a further embodiment example of a data carrier, the module and a part of the coil being shown as a detail,

FIG. 4 shows the detail of the data carrier according to FIG. 3 in a sectional view,

FIG. 5 shows a further embodiment example with an injection molded card body part,

FIG. 6 shows an injection mold with an inserted card inlay,

FIG. 7 shows a hybrid module and a card body part with a coil,

FIG. 8 shows a contactless module with the corresponding card body part and coil.

FIG. 1 shows data carrier 1 comprising card body 2 with coil 7 disposed thereon and connected electroconductively with module 6.

FIG. 2 shows enlarged and not true to scale a cross section along the broken line in FIG. 1 within the detail which includes the module, a part of the card body and the coil. Module 6 includes at least one integrated circuit 4 with two leads which are connected electroconductively with contact elements 5 of the module. The module shown in FIG. 2 consists e.g. of a Kapton carrier film which has contact elements 5 on one side. The carrier film has in known fashion accordingly positioned windows for receiving the integrated circuit and for guiding through the conductor wires from the circuit to the contact elements. For protection from mechanical loads the integrated circuit and conductor wires can be cast with a casting compound. In the embodiment example of a module shown here, the contact elements are applied to the carrier film as an electroconductive coating, they being connected e.g. by wire-bonding with the leads of the integrated circuit.

The data carrier shown in FIG. 2 is produced e.g. by the laminating technique familiar to the expert, whereby the separately produced module without a coil is laminated into a multilayer card body. Multilayer card body 2 includes upper and lower cover layers 10 as well as at least one inner card layer 11 having suitable opening 3 for receiving the module. The outside surfaces of cover layers 10 are generally provided with a print. On one of the inner surfaces of cover layers 10, in this embodiment example the upper cover layer, there is coil 7 which forms a semi-finished product with card body layer 10. Coil leads 8 are positioned so as to be disposed directly opposite contact elements 5 of module 6. This allows simple electroconductive connection of the contact elements with the coil leads. The electroconductive connection can be achieved e.g. with the help of an electroconductive adhesive. Coil 7 can e.g. be printed on a card body layer by the screen printing method by means of an electroconductive adhesive or be applied to the card body layer in the form of an electroconductive coating by the hot stamping method. Alternatively, coil 7 can also be punched out of a metal foil or an electroconductively coated plastic film and be disposed on a layer of the card body. The coil can also be fastened to the card body layer as a finished wire-wrapped coil without a core, e.g. with the help of an adhesive.

FIGS. 3 and 4 show a further embodiment example of data carrier 1. It differs from that in FIG. 2 essentially only in that coil 7 is disposed on inner layer 11 of card body 2. This inner layer of the card body likewise has suitable opening 3 for receiving module 6. Contact elements 5 of the module are preferably elbowed in this embodiment, which allows a simple realization of the electroconductive connection with leads 8 of the coil. This embodiment has the advantage that inner layers 11, which form the card inlay of the data carrier, can be prepared independently of the printing operation of cover layers 10 of the data carrier for mounting coil and module. In the embodiment examples described up to now, the data carrier was preferably produced by the laminating technique. Of course other techniques can also be applied, for example injection molding or the mounting approach. These techniques are familiar to the expert and will thus be explained only briefly in the following embodiment examples.

FIG. 5 shows a greatly schematized view of the semi-finished product already shown in cross section in FIG. 2, which includes card body layer 10 with coil 7 disposed thereon whose leads are electrically connected with the contact elements of module 6. This semi-finished product can also be mounted e.g. on injection molded card body part 12, which is provided with a suitable recess for receiving the module, and be connected with the card body part in known fashion.

FIG. 6 shows a greatly schematized view of card inlay 11 with module 6 and coil 7 already shown in FIG. 4. This separately produced semi-finished product can also be further processed e.g. by injection molding. For this purpose the card inlay with module and coil is introduced into injection mold 15 in known fashion and molded with a plastic material which then forms card body part 12.

FIG. 7 shows a schematized view of injection molded card body part 12 with two-step recess 3, leads 8 of coil 7 being disposed in freely accessible fashion on the shoulder areas of the recess. Module 6 can thus be installed in recess 3 of card body part 12 in simple fashion for example by the known mounting approach, it being easy to realize the electroconductive connection of the coil leads with the contact elements of the module. Subsequently, printed cover layer 10 can be connected with injection molded card body part 12 for example with the help of an adhesive layer.

FIG. 8 shows hybrid module 6 which has, in addition to coil 7, outer contact surfaces 9 serving the purpose of contacting, power supply and/or data exchange. Hybrid module 6 can likewise be installed in specially provided recess 3 of injection molded card body part 12 in simple fashion by the known mounting approach. For mounting the module one can use for example a contact adhesive layer or a thermally activated adhesive layer. The application of a printed cover layer as shown in FIG. 7 can be omitted here, since the desired printed image is already taken into account during injection molding of the card body. In this case the card body consists of only one layer.

I claim:

1. A data carrier having a body comprising:

at least one layer;

an integrated circuit; and

at least one coil having leads integrally formed with the coil and forming part of the body; characterized in that:

a module having the integrated circuit and at least two contact elements is electrically connected via said contact elements with the leads of the coil;

the module and the layer of the body are provided separately;

the module further comprises outer contact surfaces;

the body has a two-step recess for receiving the module, the two-step recess having a first step and a second step which is deeper than the first step; and

the coil is disposed on the first step.

2. The data carrier of claim 1, characterized in that the at least one layer of the body comprises a cover layer.

3. The data carrier of claim 1, characterized in that the at least one layer of the body comprises an insulating layer and in that the coil is formed as a flat coil which is glued to the insulating layer of the body as a finished wire-wrapped coil.

4. The data carrier of claim 1, characterized in that the coil extends essentially over an entire surface of the body.

5. The data carrier of claim 1, characterized in that the leads of the coil and the contact elements of the module are disposed opposite each other within a plane of the body.

6. The data carrier of claim 5, characterized in that the leads of the coil are glued electroconductively to the contact elements of the module.

7. The data carrier of claim 1, characterized in that the at least one layer of the body comprises an inner layer of the body.

8. The data carrier of claim 1, characterized in that the at least one layer of the body comprises an injection molded body part.

9. The data carrier of claim 1, characterized in that the at least one layer of the body comprises an insulating layer of the body and in that the coil is printed on the insulating layer of the body as an electroconductive layer.

10. The data carrier of claim 1, characterized in that the coil is stamped in a layer of the at least one layer of the body by a hot stamping method.

11. The data carrier of claim 1, characterized in that the coil is punched out of a metal foil and disposed on a layer of the at least one layer of the body.

12. The data carrier of claim 1, characterized in that the coil is punched out of an electroconductively coated plastic film and disposed on a layer of the at least one layer of the body.

13. The data carrier of claim 1, characterized in that said body consists of one layer.

* * * * *

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification [6] : [illegible]	A1	(11) International Publication Number: WO [illegible] (43) International Publication Date: [illegible] November 1998 ([illegible].11.98)

(21) International Application Number: PCT/[illegible]

(22) International Filing Date: 22 April 1998 (22.04.98)

(30) Priority Application Number: [illegible]

(32) Priority Date: 27 April 1997 (27.04.97)

(33) Priority Country: US

(71) Applicant: SOUNDCRAFT, INC. [US/US]; [illegible], Northridge, CA [illegible] (US).

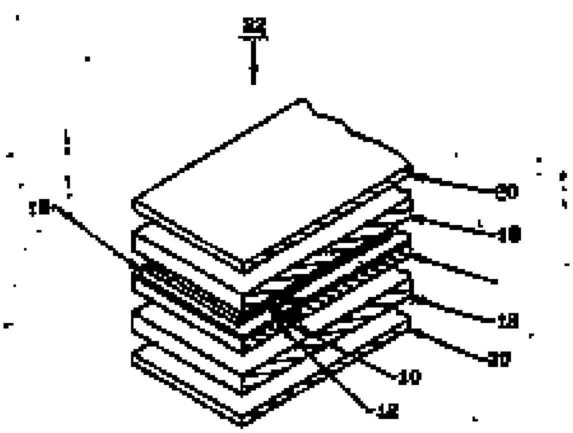
(72) Inventor: [illegible]; [illegible], Woodland Hills, CA [illegible] (US).

(74) Agent: [illegible]; [illegible], Los Angeles, CA [illegible] (US).

(81) Designated States: AT (European patent), AU, [illegible] (European patent), [illegible] (European patent), [illegible] (European patent), [illegible] (European patent), [illegible] (European patent), [illegible] (European patent).

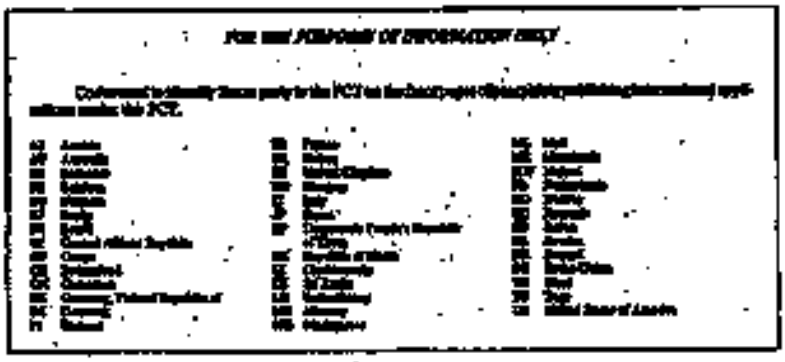
Published
- With international search report.

(54) Title: METHOD FOR THE MANUFACTURE OF AND STRUCTURE OF A LAMINATED PROXIMITY CARD



(57) Abstract

A proximity sensor card is manufactured by disposing a printed circuit element (14) onto a core layer (10) and placing the integrated circuit which is coupled to the printed circuit element into a cavity (22) defined in the core layer. The cavity is defined through the core layer and completely circumscribes the integrated circuit so that little or no portion of the integrated circuit, other than its leads, are exposed above the surfaces of the core layer. A graphics layer (18) is then disposed on each side of the core layer. A protective layer (20) is then disposed on the outside of each of the graphic layers. The multiple layers are then laminated by pressure and heat to form a bonded integrated card. The card may be preprocessed from continuous films.



P1910

G02436